

PUBLIC HEALTH REPORTS

In this issue



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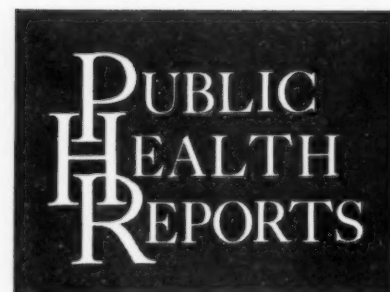


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Anechoic chamber (interior structure) and library, in the new building for Pittsburgh's Graduate School of Public Health. (Dedication seminar on pages 1005-1008.)

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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Trends in Poultry Hygiene

JOE W. ATKINSON, D.V.M.

THE POULTRY INDUSTRY has doubled in size since 1940, to become the third largest source of farm income. Poultry products, including eggs, have reached an annual value of approximately \$4 billion at the producer level and \$6 billion at the retail level. This period of rapid expansion has been accompanied by the development of widely varied practices and conditions in the poultry processing and merchandising industry.

Supermarket display cases bulge with ready-to-cook, precooked, and frozen poultry products in appetizing array, protected by colorful, eye-catching containers and packaging materials. Most of these products have been processed in large volume by production-line methods, and many have been transported long distances. Conversely, there remain numerous small poultry plants where only fresh poultry is produced, processing is accomplished with a minimum of equipment, and sales are restricted to the immediate premises or locality; in some establishments, birds may be slaughtered 1 or 2 at a time after being selected live from the coop or battery by the consumer. Also, in certain areas of the country, uneviscerated, or so-called New York-dressed, poultry carcasses are still delivered to the restaurant and hotel trade for evisceration in the kitchen

and to retail markets for evisceration or for sale "as is" to the housewife.

In competition with the processing plant where the carcasses are eviscerated immediately after slaughter and removal of the feathers, and are promptly refrigerated under sanitary conditions, there is the plant where carcasses are thrown into tanks of water or ice slush and kept for evisceration later—a very insanitary and undesirable procedure. These carcasses may even be shipped to another plant or held in frozen storage for weeks or months before evisceration (1). In like manner, plants which operate at speeds and with procedures permitting sanitary conditions and prevention of undue contamination of product must compete with those which sacrifice sanitary considerations to the desire for speed and the highest volume possible at the lowest production cost. While some products are prepared under continuous official inspection, health, labor, and consumer groups have become increasingly concerned over the majority of plants and poultry products, which have not been subjected to such inspection.

From this many-sided picture, certain trends have emerged. These include improved sanitary procedures, improved methods of lengthening the time poultry can safely be stored, a decrease in the sale of uneviscerated poultry, increased production of ready-to-cook poultry, and an increase in official poultry regulation activities. It seems almost inevitable that these trends will continue and even accelerate in the next decade, to the benefit of all concerned. However, further study is needed of methods of determining the sanitary quality of

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poultry and poultry products, the effectiveness of specific sanitary measures, and the environmental factors which contribute to injuries and infections and their prevention in the poultry processing industry.

Improved Sanitary Facilities and Procedures

Buildings, equipment, operating procedures, waste disposal facilities, and refrigeration practices are rapidly improving in the poultry processing industry. Even in many of the smaller plants, management is learning that good sanitation is good business. Buildings and equipment especially constructed, laid out, and located for poultry processing are much more efficient and economical in operation than are old, converted premises and makeshift, insanitary equipment and facilities. Products produced under sanitary conditions have good keeping quality and are easier to merchandise effectively and consistently. Sanitary surroundings contribute to employee morale and healthier working conditions, resulting in better work performance, less labor turnover, and less absenteeism because of illness (2).

It has been said that one of the tragedies of life is the murder of a beautiful theory by a gang of brutal facts (Franklin). A lot of theories on poultry processing and merchandising have been murdered by facts in recent years, and this is a trend which, we can be assured, will continue. However, it is definitely not a tragedy, because the facts have opened the way to more efficient, more sanitary, and more profitable operations.

For example, the Agricultural Marketing Service, U. S. Department of Agriculture, is cooperating in detailed studies on equipment and methods used in various stages of poultry processing. A study recently completed in Georgia on packing operations led to the development of new equipment and methods which can eliminate much of the handling and labor in the ice packing of fresh poultry and speed up and coordinate the work, thus saving money and time as well as reducing opportunity for contamination of the product. Undoubtedly, forthcoming studies in other operational areas will be equally productive.

The triumph of fact over theory is not new to

the poultry industry. A classic example is the theory of 20 years ago that poultry had to be merchandised uneviscerated, that is, as New York-dressed poultry, in order to ship it into large metropolitan markets and sell it before it spoiled. Another idea was that poultry could not be eviscerated commercially without contamination of the incised tissues and body cavity with fecal matter. These theories were thoroughly disproved long ago (3). As another example, many people believed that poultry had to be cut up on a wooden block, but the processing industry has long since learned that poultry carcasses can be suspended from a shackle or cut up on an impervious table or belt, in a manner which is just as fast and much more sanitary than the old "meatblock technique." Worth mentioning, also, is the action by U. S. Department of Agriculture inspectors encouraging removal of the liver, heart, and gizzard as the viscera hang still attached to the suspended carcass. This new procedure has accomplished its primary purpose of making possible more sanitary handling of the giblets and, at the same time, has proved to be economical and practicable in both large and small plants.

Processing operations long thought to require hand labor are now performed wholly or in large part by specially designed equipment. Minimizing personal contact with the product usually can reduce chances for contamination. Thus, the foreseeable trend toward machine boning of poultry should result in better sanitary quality of product. Unfortunately, mechanization of a particular process may not always produce happy results from a sanitation point of view; for example, present mechanized methods of defeathering poultry leave much to be desired, a situation which remains to be corrected by some future development.

Knowledge of microbiological facts pertinent to the processing of poultry products such as pies and stuffings can be used to maintain better control of refrigerating practices, ingredients, and processing operations, thereby routinely keeping bacterial counts down to levels thought impracticable of attainment a few years ago. These facts are being obtained by progressive processors through programs of research and quality control. These programs

include scheduled collections of product samples from various points along the processing line. Laboratory examination of these samples complement general sanitation supervision by identifying potential trouble spots before they develop to serious proportions. The results of these research and quality control programs may well serve as a basis for official bacterial standards in years to come.

The trend toward better sanitary facilities and procedures in the poultry processing industry will undoubtedly continue. Poultry processors are learning that the phrase "sanitation pays" is more than just a trite saying—it is a statement of fact. This has been highlighted recently by studies on various methods of prolonging the storage life of fresh poultry.

Prolonging Storage Life

For some time, new ways have been sought to extend the storage life of fresh poultry. As might be expected, the first and most essential measure has proved to be the production of sanitary ready-to-cook poultry with an initial low bacterial count. Also, unless and until a practicable method of proved safety and acceptability is developed for sterilizing raw poultry, immediate and adequate refrigeration will remain essential to long storage life.

Low Holding Temperatures, Brine Immersion

More efficient refrigeration of poultry certainly contributes to prolonged storage life. A study by the State College of Washington indicated that holding ready-to-cook poultry, after initial chilling, at 31°–32° F. rather than at 38° F. was more effective than use of certain chemicals or biologicals in the chill water (4).

Faster chilling and freezing of poultry is possible through brine immersion techniques (5). In the September 1954 issue of *Marketing Activities*, a U. S. Department of Agriculture publication, Dr. Lyle L. Davis reported:

"This method of cooling eviscerated poultry has other advantages. Packaging the product prior to cooling and combining cooling and freezing operations in one step minimizes possible contamination of birds during handling; reduces overall handling and labor costs; eliminates leaching of flavor that may take place

during slush ice cooling; and provides a higher quality product with less shrinkage and better color and appearance."

Some plants utilize brine or propylene glycol immersion freezing after chilling of the unpackaged carcasses in slush ice. This would seem to nullify most of the advantages mentioned by Davis. It would also seem less desirable from the consumer viewpoint because of the considerable amount of water absorbed by the carcasses while in the slush ice, which contributes to an increased weight of product for freezing. However, there is some evidence that holding ready-to-cook turkeys for several hours in the chilled state before freezing results in a more tender product.

Antibiotics and Inplant Chlorination

Various adjuncts to refrigeration are being utilized in poultry processing. Oxytetracycline and chlortetracycline, products of two different manufacturers, have been approved by the Food and Drug Administration for use in poultry chill water, with a maximum allowable tolerance of 7 p.p.m. in the chilled raw poultry. These antibiotics can substantially extend the storage life of sanitary fresh poultry if the product is kept properly refrigerated (6).

Antibiotic treatment of poultry is no substitute for sanitation or refrigeration. It will not make a diseased or otherwise unfit bird suitable for human consumption, nor will it improve the sanitary quality of the product. The treatment temporarily inhibits bacterial growth when applied to a fresh, sanitary product, but it is relatively ineffective on an insanitary product or when applied after bacterial reproduction has been under way for a few days—it will not improve a spoiled or inferior product. Furthermore, refrigeration is still necessary to decrease the rate of microbial growth and other deteriorative changes.

At this time, one State (Colorado) has prohibited the sale of poultry treated with antibiotics as being in violation of the State law which provides that no preservative may be added to poultry. Also, the State of Massachusetts is not permitting the sale of antibiotic-treated poultry, pending a review and ruling on the matter by State authorities.

Inplant chlorination of the water used in

poultry processing operations at 10-20 p.p.m. has proved to be "an exceptionally effective, overall means for decreasing the bacterial counts. It lowered the counts on equipment and poultry carcasses, eliminated slime, corrosion, and plant odors, cleared corroded pipes and nozzles, and reduced cleanup time and labor by more than 33 percent" (7). If proper procedures are followed, implant chlorination can be used in plants which also use the antibiotic treatment discussed above. In this regard, instructions to U. S. Department of Agriculture poultry inspection personnel (AMS PY-Instruction No. 918-10, Supplement No. 2, revised 2/13/57) on the use of antibiotics state: "When chlorinated water is used in the plant some of the poultry should be placed in the tank and should be in contact with the chlorinated water for at least 5 minutes before the stock solution of Aconize PD is added. This procedure is necessary to remove the chlorine from the water. However, this is not necessary when the antibiotic is compatible with chlorine as in the case of oxytetracycline."

Implant chlorination extends storage life of the product by reducing initial bacterial load. It is comparatively economical and improves plant sanitation generally. Therefore, it is somewhat surprising that more processors have not taken advantage of it. This is a procedure which would be quite beneficial in both large and small plants, and it seems worthy of serious consideration as a required sanitary measure under official regulatory programs.

"New York-Dressed" on Way Out

The trend toward production of ready-to-cook poultry continues. It is estimated that only about 10 percent of poultry is now sold to the consumer in the New York-dressed, uneviscerated form. However, a substantial amount of slaughtered poultry, estimated as another 20 percent, is chilled, stored, shipped, or delivered to commercial establishments prior to actual evisceration. These practices are very objectionable from the health and sanitation viewpoint, and regulatory measures will undoubtedly be needed in some instances to completely correct this situation (1, 8).

Problems and Needs

In spite of the significant advances discussed above, more information is needed for an intelligent and scientific approach to the health and consumer problems associated with the processing and consumption of poultry.

Diseased Poultry

At least 26 diseases of poultry are known to cause infection in man (9-12). Some occur infrequently, however, and do not seem to present a significant public health problem. Others are not recognized as hazards specific to plant employees or consumers; in this latter category are eastern and western equine encephalomyelitis and St. Louis encephalitis.

Birds are believed to be the most important vertebrate hosts for viruses of these three diseases. Natural outbreaks have been observed in songbirds, ring-necked pheasants, and pigeons. Domestic fowl may have specific antibodies for the viruses and, when experimentally inoculated, chickens may develop a viremia but show no signs of illness. However, although the possibility of direct transmission cannot be ruled out, investigations indicate that these types of encephalitis are transmitted to man through insect bites.

Of the other diseases common to poultry and man, only a few have been shown to be transmitted to man from poultry, for example, salmonellosis, Newcastle disease, and psittacosis, except in rare instances. Even when no health hazard is involved, however, the consumer does not want to buy or eat food derived from or contaminated by diseased poultry, and the plant employee does not want to handle or be exposed to diseased carcasses or obnoxious materials.

Employee Health Problems

Reports to the Bureau of Labor Statistics indicate that the injury frequency rate in the poultry and small game dressing and packing industry is exceeded among 135 manufacturing industries only by the rates for logging and for sawmills and planing mills and is significantly higher than that of the red meat packing industry. The "injury frequency rate" is the number of disabling "injuries," including infections, per million man-hours worked which

result in death, permanent physical impairment, or loss of employment for a day or more. For example, if an employee contracts a skin rash but continues to work, the condition is not reported. Unfortunately, we do not have information on the frequency of specific infections or injuries, with the exception that several hundred cases of psittacosis have been reported as transmitted from poultry to man since 1948, with 137 known cases, including 4 deaths, occurring in 1956.

Injury frequency rate¹ in selected industries

Industry	1955	1956 ²
Average for all manufacturing.....	12.1	11.9
Logging.....	73.5	69.4
Sawmills and planing mills.....	41.5	41.3
Poultry and small game: dressing and packing.....	34.3	36.7
Meatpacking and custom slaughtering.....	18.9	19.1
Sausage and other prepared meat products.....	20.2	24.0
Steel foundries.....	19.9	23.8
Construction and mining machinery.....	16.5	17.8
Blast furnaces and steel mills.....	4.8	4.5

¹ Disabling injury or infection per 1 million man-hours worked resulting in absence from job of 1 day or more.

² Tentative.

SOURCE: Bureau of Labor Statistics Quarterly Report, June 19, 1957.

A comparison of the reported injury frequency rates of only a few industries indicates the need for studies that will more definitely delineate the problems and develop corrective measures in the poultry processing industry.

Foodborne Disease

The role of poultry in foodborne disease outbreaks is also worthy of consideration. Over 30 percent of the cases of foodborne disease reported by the States to the National Office of Vital Statistics are associated with poultry and poultry dishes. During the 10-year period, 1945-54, 31,832 of a total of 97,485 cases reported, or 32.6 percent (13), were attributed to the consumption of poultry; in 1955, 1,610 of 9,633 cases, or 16.7 percent; and in 1956, 3,994 of 11,133 cases, or 35.8 percent.

Domesticated poultry is a major natural reservoir of *Salmonella*. Numerous investigators have shown that poultry and poultry products

carry organisms of potential food poisoning types while in the poultry processing establishment and when shipped therefrom.

It must be emphasized, however, that the contamination of poultry and poultry products may originate apart from the poultry itself, as from careless or infected plant workers or kitchen personnel, rodents, insects, sewage, unsafe water, dust, or other sources found in insanitary environments or resulting from poor food preparation practices. Epidemiological investigations of foodborne outbreaks associated with poultry and poultry products frequently fail to disclose whether the contamination originated with the bird, the environment, or the food handler. Lack of proper refrigeration before or after preparation of the food often appears to be a contributing factor.

Although other classes of perishable foods may be exposed to similar hazards of mishandling during distribution or in the kitchen, they are not so frequently associated with foodborne outbreaks as are poultry and poultry products.

Research and Investigations Needed

In view of the above, it is evident that continuing epidemiological and public health field and laboratory investigations are needed to learn more about—

1. Microbiological and chemical procedures, and possibly standards, for laboratory and field use in determining the sanitary quality of poultry and poultry products.
2. The health and consumer significance of certain commercial practices, including new processing and merchandising techniques and product treatment procedures.
3. Practical sanitary measures for preventing contamination of poultry and poultry products during processing, and the relative effectiveness of these measures for reducing the incidence of foodborne disease outbreaks associated with poultry.
4. The environmental factors which contribute to the high injury frequency rate in the poultry processing industry, the specific infections and injuries occurring, and practical preventive measures.

Nevertheless, as has been done with respect to health and consumer problems in other food industries, official agencies, while continuing the

search for new knowledge, must act on the basis of information currently available in establishing poultry inspection and sanitation safeguards.

Official Inspection and Supervision

Interested groups agree on the need for inspection of poultry for wholesomeness and sanitary supervision of poultry processing. In fact, the trend toward official poultry regulatory activities has recently accelerated to the extent that official inspection services will probably be provided to a major portion of the poultry processing industry within the next few years. These regulatory programs will not prevent all foodborne outbreaks associated with poultry or all illness among poultry plant employees. However, very definite benefits can be derived from such programs.

Control of sanitary factors in the processing and distribution of poultry (14), and proper antemortem and postmortem inspection of poultry for wholesomeness (15) can—

1. Remove from food channels poultry determined to be diseased or otherwise unfit for consumption.

2. Prevent, insofar as possible, contamination of the carcasses of healthy poultry during processing by disease matter and organisms from sick birds or by fecal matter and other wastes.

3. Within the framework of current knowledge, assure sanitary conditions and proper refrigeration within the processing establishment, proper packaging and labeling of product, and protection of product from contamination or spoilage while in distribution channels.

4. Minimize the exposure of employees to diseased poultry carcasses and wastes and exudates therefrom, and assure sanitary working conditions in clean, well-lighted, and well-ventilated surroundings.

5. Contribute to early detection of diseased poultry flocks and to the institution of treatment, segregation, vaccination, or other disease control measures, as well as to research and field investigations where indicated.

Official Services

For almost 30 years, the U. S. Department of Agriculture has provided a poultry inspection

service to be used voluntarily by processors with the costs borne by them. Over 300 plants now operate wholly or partly under the department's inspection, and it is estimated that about 30 percent of poultry sold off farms was thus inspected in 1956. Over 1.4 billion pounds of ready-to-cook poultry were certified for wholesomeness. Rejected were 2,888,417 poultry carcasses, weighing 11,270,951 pounds.

The U. S. Department of Agriculture poultry inspection service has done much to improve sanitation and operational procedures in the poultry industry and to set the stage for further progress. The need of the Armed Forces for substantial amounts of inspected poultry has been a major factor in the growth of the inspection program. Firms voluntarily operating under and financing this program have also contributed toward the improvements and the progress which have resulted.

The Food and Drug Administration helps assure the wholesomeness of poultry products shipped interstate by inspecting processing plants to uncover practices which may result in shipment of adulterated poultry and by examining poultry in wholesale and retail markets.

The Food and Drug Administration recently distributed to State and local officials a Manual for the Examination and Evaluation of Poultry and Poultry Products for Compliance with the Federal Food, Drug, and Cosmetic Act (15). Developed jointly by the Food and Drug Administration and the Public Health Service, the manual deals with antemortem and postmortem inspection of poultry and contains recommendations on the disposition of poultry affected by various diseases and other conditions. It is expected that the manual will be given more general distribution after receipt of comments from State and local agencies.

In 1955, the Public Health Service published a recommended poultry sanitation ordinance (14) for voluntary use by interested State and local agencies. This ordinance was developed with the cooperation and advice of the poultry industry, professional organizations, and interested Federal, State, and local agencies (13, 16). In addition, the Public Health Service has developed a motion picture and several

filmstrips as visual training aids for persons concerned with poultry inspection and sanitation (17). Limited research on poultry diseases transmissible to man has been conducted and participated in by the Service, particularly in connection with outbreaks of psittacosis among poultry plant workers in Texas and Oregon. The Public Health Service is providing partial financial support for research projects at the Iowa State College on the microbiology of poultry processing and of precooked frozen foods.

The Public Health Service is cooperating with the Colorado State Department of Agriculture and the Department of Health and Hospitals, City and County of Denver, in a poultry sanitation demonstration project. The purpose of the project is to study the application at the local level of the administrative and sanitation provisions of the model poultry ordinance developed by the Service. It is hoped that the experience and information gained will be helpful to other State and local agencies.

A substantial number of States and municipalities are conducting or initiating programs dealing with sanitation in the processing and distribution of poultry; several are expanding their activities to include inspection of the poultry for wholesomeness. The inspection services have been limited to voluntary programs except in California where, under the State mandatory program, actual inspection is conducted by licensed poultry plant owners or employees.

Mandatory Federal Inspection

Despite the efforts of States and municipalities, mandatory Federal inspection of poultry for wholesomeness and control of sanitation is needed in plants which process poultry for interstate commerce. The first decisive step toward such inspection was taken early in 1956, with the introduction of bills in Congress calling for a mandatory poultry inspection service to be administered by the Food and Drug Administration. Since that time, all groups concerned have testified to the need for such an inspection service, and many have advised that it be administered by the U. S. Department of Agriculture.

Five hearings have been held before congressional committees, and as a result Public Law 85-172 has been enacted by Congress.

This law provides for compulsory inspection by the U. S. Department of Agriculture of poultry and poultry products processed in plants engaging in interstate and foreign commerce. It also provides authority for the Secretary of Agriculture, under certain conditions, to conduct public hearings and to designate areas of intrastate commerce to be subject to the provisions of Federal law.

State and Local Programs

Will a mandatory Federal poultry inspection program eliminate the need for State and local controls? Certainly it will make the problem much smaller. Just as certainly there will be a definite need for official regulation by the States or municipalities of processing plants which do not operate under the Federal inspection system, and of poultry and poultry products in wholesale and retail channels outside the processing plants (8).

More than twice as many poultry processing plants ship products only intrastate as engage in interstate commerce. A substantial quantity of poultry is processed in these plants. Official regulation by States and municipalities will be needed not only to provide protection of health and consumer interests in connection with the poultry normally processed in plants which ship only intrastate, but also because with an effective Federal poultry inspection program and concurrent absence of such a program at State and local levels, such plants might become a "dumping ground" for diseased, unfit poultry.

Presumably the Food and Drug Administration will continue its activity of checking on poultry or poultry products which have entered interstate commerce, particularly when contamination or decomposition is suspected. However, approximately 50 percent of poultry moves only intrastate, and even if it has been inspected at the time of processing, after it has left the processing plant it remains a problem for State and local agencies.

Furthermore, when disease breaks out among poultry plant employees or when foodborne disease is reported, State or local officials will still have the responsibility for making investigations and taking action to prevent repetition of these outbreaks.

Summary

Although the rapid expansion of the poultry industry has resulted in extreme contrasts in poultry processing methods, certain trends in poultry hygiene are evident.

Improved sanitary facilities, equipment, refrigeration methods, and operating procedures are being developed. New means for prolonging the storage life of poultry products are being utilized, and others are being tested. The sale of New York-dressed (uneviscerated) poultry is decreasing and the production of ready-to-cook poultry is increasing. Underway are studies designed to further the improvements in sanitary practice and operational procedures which have already contributed to more efficient and profitable industry operations. Official regulatory programs by Federal, State, and local authorities are increasing.

Research and investigations on public health and employee health problems associated with poultry and poultry processing are still needed. Nevertheless, information now available can be used to the benefit of all concerned with the further expansion of official poultry sanitation and inspection services at the Federal, State, and local levels.

REFERENCES

- (1) Atkinson, J. W.: "New York-dressed" poultry. *Mod. San.* 8: 25, 52-53, May 1956.
- (2) Hawkins, C. P.: Establishing a small plant house-keeping program. *Mod. San.* 8: 45-46, 48-49, July 1956.
- (3) Gunderson, M. F.: Do the job right when you're eviscerating poultry. *U. S. Egg & Poultry Mag.* 52: 253-255, 275, July 1946.
- (4) Spencer, J. V., Ziegler, F., and Stadelman, W. J.: Recent studies of factors affecting the shelf-life of chicken meat. *State College of Washington Stations Cir. No. 254.* Pullman, 1954.
- (5) Esselen, W. B., Levine, A. S., Pflug, I. J., Davis, L. C.: Brine immersion cooling and freezing of ready-to-cook poultry. *Refrig. Engin.* 62: 61-63ff., July 1954.
- (6) Miller, W. H.: Antibiotic introduced as spoilage inhibitor for fresh poultry. *Food Engin.* 28: 43-48, 194, January 1956.
- (7) Drewniak, E. E., Howe, M. A., Jr., Goresline, H. E., and Baush, E. R.: Studies on sanitizing methods for use in poultry processing. U. S. Department of Agriculture Cir. No. 930. Washington, D. C., U. S. Government Printing Office, March 1954.
- (8) Atkinson, J. W.: Official poultry inspection; Public health viewpoint. *Vet. Med.* 52: 169-174, April 1957.
- (9) Brandly, P. J.: Poultry inspection as part of the public health program. *J. Am. Vet. M. A.* 112: 10-17 (1948).
- (10) Ingalls, W. L.: The public health aspects of poultry diseases. *Proc. Am. Vet. M. A.* 87: 282-291 (1950).
- (11) Felsenfeld, O.: Diseases of poultry transmissible to man. *Iowa State Coll. Vet.* 13: 89-92 (1951).
- (12) Galton, M. M.: Poultry diseases transmissible to man including summary report of outbreaks. Atlanta, Ga., Communicable Disease Center, 1953. Mimeographed.
- (13) Atkinson, J. W.: Development of a poultry ordinance. *Pub. Health Rep.* 71: 471-476, May 1956.
- (14) U. S. Public Health Service: Poultry ordinance. PHS Pub. No. 444. Washington, D. C., U. S. Government Printing Office, 1955.
- (15) U. S. Food and Drug Administration: Manual for the examination and evaluation of poultry and poultry products for compliance with the Federal Food, Drug, and Cosmetic Act. Washington, D. C., 1956. Mimeographed.
- (16) Sullivan, T. E.: The U. S. Public Health Service model poultry ordinance and code. *J. Milk & Food Technol.* 18: 130-133, May 1955.
- (17) U. S. Public Health Service: Poultry hygiene film series. Operating procedures. Plant layout and construction. Refrigeration. Waste disposal, cleanup, and basic sanitation. *Pub. Health Rep.* 71: 1080, November 1956; 72: 340, April 1957.

A study in 1956 reflects the wide variation in the legislative, organizational, fiscal, and operational aspects of local air pollution control activities, a situation to be expected at this time in view of variations in severity of air pollution and in degrees of public support given to its palliation.

Administration of Air Pollution Control in the United States

P. W. PURDOM, M.S.E.

BIOLOGICAL effects of polluted air and techniques of controlling atmospheric contaminants have been studied frequently and reported regularly. Few investigations have been made, however, of the administration of air pollution control programs. Yet administration provides the machinery necessary for transforming technical knowledge into positive action to enhance the urban atmosphere.

This paper analyzes information obtained in a survey of administrative characteristics of local air pollution control agencies in the spring of 1956. Since the study deals with practice, the data do not necessarily reflect ideal situations. Furthermore, air pollution problems vary with the peculiarities of the individual community, and the extent of the control program will vary according to the local needs. Keeping in mind these two considerations, administrators of air sanitation activities may find the data instructive.

Mr. Purdom is director of the division of air pollution control and environmental sanitation, Department of Public Health, Philadelphia, Pa. He prepared this paper from a much more detailed report of the study which he had presented at the annual meeting of the Conference of Municipal Public Health Engineers, Atlantic City, N. J., November 14, 1956.

From various sources, a list of 144 pollution control agencies was prepared, and a questionnaire was sent to each. Ninety-three agencies (65 percent) responded, 82 of which claimed active programs. The population served by the agencies ranged from 10,000 to 8,000,000. All of the communities with populations of 1,000,000 and over replied; however, below 50,000 population, there was only a 37.5 percent response.

Background Data

The questionnaire asked, among other things, for data on the industrial and commercial nature of the community and on the quantity of various fuels consumed. It was anticipated that such information might be indicative of the need for various types of control. Response was disappointing. The number reporting was so small that the data were not considered worthy of presentation. This suggests that communities do not have information that would be of value in determining the type of program needed in the community. It should be recognized, however, that under severe conditions organoleptic responses of individuals are sufficient to motivate control of air pollution.

To provide needed background, the agencies were asked to enumerate the major sources of air pollution in the area. Their answers, tabu-

lated below, reflect local opinion concerning the most serious sources in that area. They do not necessarily provide an all-inclusive list of sources of air pollution. If an industrial operation did not exist in a community, it obviously would not be a problem.

Source	Number times reported
Open burning (refuse, scrap, industrial wastes) ..	18
Metal smelting and refining	14
Gasoline and diesel motive equipment (autos, trucks, locomotives)	12
Chemical industries (not specified)	9
Lumber, furniture, and so forth	9
Industrial (not specified)	8
Incinerators (domestic, apartment, commercial) ..	8
Oil refining	5
Railroad locomotives (coal burning)	5
Sulfur and sulfuric acid	4
Asphalt plants	4
Meat packing and rendering plants	4
Paint manufacturing	4
Fertilizer plants	3
Textiles	3
Laundries	3
Aggregates	3
Cement manufacturing	3
Farm products processing	3
Apartments, hotels, schools, substandard dwell- ings	3
Paper and pulp	2
Paint spray booths	2
Other (ammonia, rubber, lithographing, pollen, gas plant, food processing, milling, roofing, burning natural gas)	9

Open burning was the most frequently cited major source of air pollution. This is a deplorable situation since sanitary methods of

refuse disposal which obviate any need for burning in the open are readily available and economically feasible for all communities.

Laws regulating air pollution and standards for compliance are usually adopted locally. Communities of 1,000,000 or more population frequently use board regulations to establish standards. Most of the communities in this study had laws controlling smoke, fly ash, odors, toxic gases, and nuisances, with no apparent trend due to population size. This finding indicates a tendency for communities to recognize air pollution problems through legislation, but not necessarily through support of program budget.

Administrative Status

There were no independent air pollution control agencies in the smallest population groups, but more than 50 percent in the largest group were independent (table 1). This is logical. In small areas, the workload may not be heavy enough to justify full-time employees, and administrative overhead costs of an independent agency may be prohibitive. In large areas, an independent agency may be justified on the ground that it lends greater emphasis to the air sanitation program. However, the fact that, even in the large population groups, independent status is not universal indicates that there may be advantages to conducting the activities as part of a larger administrative structure if administrative costs can be reduced without sacrificing emphasis.

Table 1. Administrative status of air pollution control, by population group, air pollution control survey, 1956

Population group	Num- ber report- ing	Inde- pend- ent	Build- ing de- part- ment	Health depart- ment	Safety depart- ment	Other	Split
Under 50,000	11	0	5	3	1	2	0
50,000-99,000	11	2	2	3	2	2	0
100,000-199,000	18	3	5	4	3	2	¹ 1
200,000-499,000	18	4	4	6	1	3	0
500,000-999,000	15	2	2	4	3	2	² 2
1,000,000 and over	9	5	1	3	0	0	0
Total	82	16	19	23	10	11	3
Percent	100	19.5	23.2	28.0	12.2	13.4	3.7

¹ Split between health and building.

² 1 split between health and safety and 1 between health and public works.

Table 2. Number of full-time professional and technical employees per 100,000 population served, according to range of per capita expenditures, air pollution control survey, 1956

Per capita expenditure	Number agencies in range	Number full-time professional and technical employees per 100,000 population served ¹			
		Minimum	Maximum	Median	Average
\$0.000-\$0.049	5	0.13	0.88	0.23	0.36
\$0.050-\$0.099	17	.51	1.75	1.00	1.03
\$0.100-\$0.149	11	1.08	2.44	1.82	1.77
\$0.150-\$0.199	3	2.16	2.67	2.50	2.44
\$0.200-\$0.299	1	3.17	3.17	3.17	3.17
\$0.300 and over	2	3.33	4.18	3.76	3.76
All reporting ²	39	.13	4.18	1.38	1.46

¹ Includes inspectors.

² Characteristics of this group are: range, \$0.020 to \$0.529; median, \$0.091; average, \$0.109.

The health department seems to have a slight edge over any other department as the agency responsible for air sanitation. Possibly this is due to development of air pollution control as an expansion of interest in industrial hygiene and implant exposures to toxic substances. Also, this arrangement permits combining the chemical laboratories serving industrial hygiene and air pollution control. Certainly there is great need for coordination between industrial and air sanitation, and also between these and stream sanitation, to prevent the activities of one from causing changes that create problems for the others.

In the three instances where responsibility for air sanitation was shared by two departments, the health department was concerned primarily with odors and gases and another department was responsible for smoke abatement. This would appear to be an unsatisfactory arrangement. It does not readily permit a unified approach. In addition, there are the usual possibilities of costly duplication of effort and facilities or confusion resulting in no action on problems assumed by one agency to be within the province of the other.

Budget

Quality and quantity of work that an agency can perform are probably more dependent on its budget than on any other single factor. In this study, the annual per capita expenditure was the basis for comparison. Forty-six agencies reported data which could be used,

including seven for which the budget was estimated from personnel salary data. The number is rather disappointing as it represents only 56 percent of the 82 jurisdictions reporting active programs. In many instances where air pollution control was an activity in a larger department, it was stated that the budget was not kept separately. Even in such situations, it seems that it would be essential to proper management to know approximately the portion of the budget used for the air sanitation program.

Expenditures varied from 1 cent to 53 cents per capita, with a median of 8 cents. For agencies in health and building departments, the median budget was about 5 cents per capita. For those in other departments and for independent agencies, the median cost varied from 9 to 11 cents per capita.

No correlation between population served and per capita expenditures was observed. Per capita costs were related to the number of personnel provided per 100,000 population (table 2). Furthermore, a comparison of budget data for 1952 with 1956 data showed that cost changes were not related to population changes but that they were related to differences in the number of personnel.

Information was obtained and analyzed concerning salaries paid various categories of full-time technical and professional personnel (table 3). Salaries paid technically trained personnel exceeded those of other employees. No comparison was made with compensation in

Table 3. Salaries paid personnel other than head of air pollution control agencies, air pollution control survey, 1956

Personnel classification	Number agencies reporting	Lowest grade—minimum salary ¹			Highest grade—maximum salary ¹		
		Lowest	Median	Highest	Lowest	Median	Highest
Engineers.....	13	\$4, 200	\$5, 280	\$6, 950	\$4, 200	\$7, 430	\$12, 000
Chemists.....	9	4, 104	5, 000	6, 192	4, 992	6, 149	11, 100
Inspectors.....	25	2, 980	4, 000	5, 743	3, 582	4, 500	6, 900
Laboratory assistants.....	4	2, 750	3, 075	3, 600	3, 600	3, 667	3, 925
Supervising inspector.....	7	3, 770	5, 647	6, 900	4, 576	6, 198	9, 564

¹ When a fixed salary for a grade was reported, the single salary was used in both maximum and minimum calculations.

other fields of employment, but salaries of scientific personnel were generally below national averages. Surprisingly, the director's compensation did not appear to be related to the budget of the agency or the number of personnel supervised, but it varied with population served and education required. College training was required in 25 of 31 communities with more than 100,000 population. It was not required, however, in 7 of 8 communities smaller than 100,000.

It should be emphasized here that numbers of personnel employed were not related to area of the community or population served. Commercial and industrial characteristics of the

communities were not described sufficiently to test for a correlation with such factors.

With respect to engineering personnel in particular, it was noted that there was little opportunity for a college graduate to begin employment directly upon graduation and make a career in an air pollution control agency. Most of the agencies required experience for all engineering positions.

Type of Services

More comprehensive services were generally provided for the communities with larger populations (table 4). The data indicated that to

Table 4. Percentage of agencies with specified services, by population group, air pollution control survey, 1956

Type of service	Population group						
	Under 50,000 (N=10)	50,000-99,000 (N=10)	100,000-199,000 (N=14)	200,000-499,000 (N=14)	500,000-999,000 (N=13)	1,000,000 and over (N=8)	All reporting (N=69)
Complaint investigation.....	90	100	100	100	92	100	98
Violation detection.....	100	80	93	79	92	100	90
Operation and maintenance surveys.....	70	30	29	64	62	100	57
Plan review.....	30	30	21	71	77	75	52
Installation permits.....	50	40	71	57	77	75	62
License, equipment installers.....	10	20	29	36	23	0	22
License, equipment operators.....	0	10	0	14	23	0	8
License, plants.....	10	0	7	7	31	25	13
Plant air pollution source surveys.....	40	30	29	50	62	88	48
Area air pollution source surveys.....	30	30	29	57	46	88	45
Vegetative surveys.....	10	10	21	7	0	25	12
Laboratory services.....	20	10	14	36	15	88	28
Stack sampling.....	20	20	14	14	47	75	29
Air sampling:							
Particulates.....	20	40	29	57	62	88	48
Gases.....	0	20	7	36	62	75	32
Weather.....	0	20	7	14	47	50	22
Other service.....	0	0	21	14	31	63	20

provide the barest of service for a balanced program required at least 5 cents per capita. To provide minimally adequate services and personnel seemed to necessitate from 10 to 15 cents. For more complete services 15 cents or more per capita would be needed, depending upon the local problem and emphasis demanded.

Most of the agencies reported that detection and determination of air pollution violations result mainly from visual and olfactory observations. Frequently, these observations are supplemented by simple test equipment, such as a smokescope. This would indicate that small communities can readily engage in air pollution control programs without maintaining extensive laboratory facilities or equipment, particularly if technical assistance is available from the State health department.

One-third of the agencies reported no laboratory services available. Another one-third reported that State laboratories or commercial or institutional laboratories were used when needed. The remaining one-third reported that laboratory services of various types were part of the local program.

A thoughtful investigator might assume that techniques for achieving community participation in the air sanitation program would receive primary attention. The survey results

were therefore quite surprising. Only about one-tenth of the agencies reported any continuing industry or citizens committee to advise the control officials on matters of general interest. In fact, about one-third of the departments reported little or no community participation. Four agencies stated that their only contact was through complaints, and it appeared in at least one instance that even this contact was resented by the control agency. It is suggested that in most communities there are many people and many groups of people who can, and will if asked, contribute to an air sanitation program. With so few employees in most agencies, it is amazing that this method of multiplying effort has not been utilized more fully.

Conclusion

This paper is by no means exhaustive; rather it is suggestive of areas of administration of air pollution control programs worthy of further investigation. While much has been written concerning technical progress, little attention has been given to the administrative mechanisms necessary to use the technical knowledge effectively. To achieve the objective of clean air, administrative practice must keep pace with technical advances.

National Advisory Committee

A National Advisory Committee on Chronic Illness and Health of the Aged has been formed by Surgeon General Leroy E. Burney to advise on Public Health Service policy and programs for the complex medical, social, and economic problems associated with chronic illness and aging.

The 13-member committee met for the first time in Washington, D. C., October 17-18, 1957. Members are:

Dr. Robert Dyer, chief, division of preventive medical services, California State Department of Health, Berkeley; Dr. Michael N. Dacso, director, department of physical medicine and rehabilitation, Goldwater Memorial Hospital, New York City; Dr. Kieffer D. Davis, medical director, Phillips Petroleum Company,

Bartlesville, Okla.; Dr. Wilbert C. Davison, dean and professor of pediatrics, Duke University School of Medicine, Durham, N. C.

Dr. Ralph E. Dwork, director, Ohio State Department of Health; Dr. Henry B. Mulholland, assistant dean, University of Virginia Medical School, Charlottesville, Va.; Dr. Herbert K. Cooper, Lancaster (Pa.) Cleft Palate Center; Miss Emilie G. Sargent, executive director, Visiting Nurse Association, Detroit, Mich.

Commissioner John W. Tramburg, New Jersey State Department of Institutes and Agencies; William L. Rutherford, Forest Park Foundation, Peoria, Ill.; Dr. Cecil G. Sheps, executive director, Beth Israel Hospital, Boston, Mass.; Miss Helen M. Lipscomb, executive director, Chronic Illness Service Center, San Francisco; and Ben Grossman, director, Drexel Home, Chicago.

Assistance for Dental Diagnostic and Treatment Facilities

FEDERAL assistance to communities for the construction of dental facilities for the diagnosis and treatment of ambulatory and dental patients through the provision of the Hospital Survey and Construction Program, popularly known as the Hill-Burton Program, has stimulated interest in the development of these facilities.

Under this program more than 3,000 communities have received aid for the construction and equipment of hospitals and health centers. Since the act was amended in 1954, many other communities have applied for assistance in building and equipping nursing homes, chronic disease hospitals, rehabilitation centers, and diagnostic and treatment facilities for ambulatory patients, including patients in need of dental care.

Assistance is provided through allotment of Federal funds to States for grants to local facilities on a matching basis. Construction includes new buildings, expansion, remodeling and alteration of existing buildings, and initial essential equipment, as well as architects' and consultants' fees, site survey, and soil investigation.

A diagnostic and treatment center, as defined in the act, is "A facility providing community service for the diagnosis or diagnosis and treatment of ambulatory patients, which is operated in connection with a hospital, or in which patient care is under the professional supervision of persons licensed to practice medicine or surgery in the State, or, in the case of dental diagnosis or treatment, under the professional supervision of persons licensed to practice dentistry in the State."

This report was prepared by the Division of Hospital and Medical Facilities, Bureau of Medical Services, Public Health Service.

Dental facilities may be constructed under the 1954 amendments with priority determined by specific need for dental or medical diagnostic and treatment facilities, but the project for dental facilities per se must be definable as a project in area and service.

The minimum State allotment is \$100,000 for diagnostic and treatment facilities. Allotments are dependent on (a) size of appropriation, (b) the population of the State, and (c) the per capita income of the State. The allotment increases with population but decreases as per capita income rises.

The rate of Federal participation in projects is established by the State administering agency in accordance with principles set forth in the act. In no case, however, may the Federal share be less than 33 $\frac{1}{3}$ percent or greater than 66 $\frac{2}{3}$ percent.

An applicant for funds for diagnostic and treatment centers must be either a State, political subdivision, or public agency, or a corporation or an association which owns and operates a nonprofit hospital.

The State agency administering the Hospital and Medical Facilities Survey and Construction Program approves projects eligible under the act in conformance with a State plan and forwards State-approved projects to the Public Health Service for final approval. An applicant should contact the State administering agency to determine the availability of funds and the priority position of the project contemplated.

In all States and Territories but eight, the department or board of health is the designated agency. For these eight, the agency is—

Florida State Development Commission, Tallahassee.
Louisiana State Department of Hospitals, Baton Rouge.

Michigan Office of Hospital Survey and Construction, Lansing.

Mississippi Commission on Hospital Care, Jackson.
New Jersey State Department of Institutions and Agencies, Trenton.

New York Joint Hospital Survey and Planning Commission, Albany.

North Carolina State Medical Care Commission, Raleigh.

Pennsylvania State Department of Welfare, Harrisburg.

Estimate of Tuberculosis Prevalence in the United States, 1956

STANLEY GLASER, DONALD A. TRAUGER, and
ARTHUR H. WYMAN

THE PREVALENCE of tuberculosis is the total number of cases on any one day. At the beginning of 1956, there were an estimated 250,000 active cases of tuberculosis in the continental United States. Of this number, 150,000, or 60 percent, were known to State and local health departments. The rest of the estimated number comprised unknown cases, that is, currently unreported cases and a small number previously reported but since lost to supervision (table 1).

The estimates show that there also were 550,000 inactive cases. Of these, 250,000 were known to the health departments. The total number of active and inactive cases was estimated at 800,000.

In addition, there were an estimated 1,200,000 persons who once had tuberculosis but who do not now require supervision according to State and local health department standards. Although these persons do not now require public health supervision, they constitute a reservoir of potential cases susceptible to reactivation.

Change From 1952

The last estimates of prevalence of tuberculosis in the United States were made in 1952 (1). Because subsequent data indicated that

the figures for 1952 had been overstated, it was necessary to adjust some of the 1952 estimates downward. Both original and adjusted figures are shown in table 2. In calculating the percent change between 1952 and 1956, the adjusted estimates were used.

In 1956, the estimated total number of active cases shows a drop of about 30 percent from 350,000 in 1952; the known cases in this category decreasing by 20 percent, and the number of unknown cases by 35 percent.

In 1952, the total of estimated inactive cases was 600,000. This number had decreased to 550,000 by 1956, a change of nearly 10 percent. While the figure for the known inactive cases remained at 250,000, the estimated number of unknown inactive cases dropped from 350,000 to 300,000.

Although there has been a sizable decline in active tuberculosis cases in the United States, and a small decline in the inactive cases, the number of persons who once had active tuberculosis shows a 15 percent increase, from 1,050,000 in 1952 to 1,200,000 in 1956. The total number of cases of tuberculosis plus the persons who once had the disease has apparently remained at about 2,000,000.

Active cases are declining more rapidly than inactive cases, and unknown active cases, those not known to the health departments, are declining most rapidly.

The proportion of active cases hospitalized is increasing. Of the active cases known to health departments in 1952, 55 percent were hospitalized. In 1956, 60 percent were hospitalized (fig. 1).

Mr. Glaser serves as chief statistician, and Mr. Wyman, statistician, with the Program Services Section, Tuberculosis Program, Division of Special Health Services, Public Health Service. Mr. Trauger is director of the social research division, National Tuberculosis Association.

Although active cases are becoming inactive at a more rapid rate than in the past, an increasing proportion of the patients remain on drug

Table 1. Number and rate of tuberculosis cases and persons who once had tuberculosis, 1956¹

Category	Number	Rate per 100,000 population ²
Total cases.....	800,000	480
Known.....	400,000	240
Unknown.....	400,000	240
Active cases.....	250,000	150
Known.....	150,000	90
Unknown.....	100,000	60
Inactive cases.....	550,000	330
Known.....	250,000	150
Unknown.....	300,000	180
Persons who once had tuberculosis.....	1,200,000	720
Total cases plus persons who once had tuberculosis.....	2,000,000	1,200

¹ All estimates rounded to the nearest 50,000. Rates are rounded to the nearest 10 per 100,000 population.

² Based on population of the continental United States for July 1, 1956, as published in Bureau of Census Current Population Reports, series P-25, No. 146.

therapy for substantial periods of time after they have ceased to be active. The revised 1952 estimates of known cases indicate that of the total cases known to health departments at that time, 45 percent were active. In 1956 the proportion of these cases known to health departments was somewhat less, about 40 percent. Although the proportion of inactive cases was larger in 1956 than in 1952 (fig. 2), the actual number of inactive cases known to health departments was about the same in 1956 as in 1952 (table 2).

Basis of 1956 Estimates

Source data on which these estimates were based varied greatly in reliability. The following sections of this report describe the source materials and methods used in a way to permit evaluation of the soundness of the separate estimates derived.

Known Active Cases

The known active cases include: (a) all diagnosed cases of tuberculosis in tuberculosis hospitals (including a small number of cases diagnosed other than active, but excluding suspects or persons under observation for tuber-

Table 2. Tuberculosis cases and persons who once had tuberculosis, 1952 and 1956, showing number and percent change¹

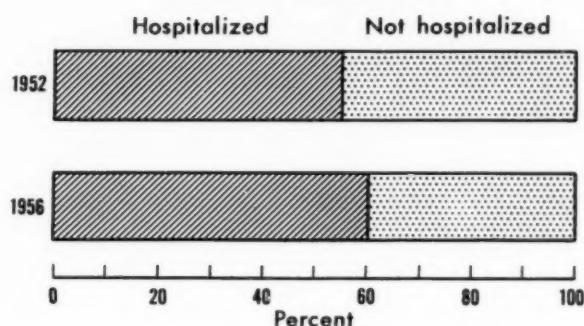
Category	1952 estimates		1956 estimates	Percent change 1952-56 ³
	Published	Adjusted ²		
Total cases.....	1,200,000	950,000	800,000	-15
Known.....	500,000	450,000	400,000	-10
Unknown.....	700,000	500,000	400,000	-20
Active cases.....	400,000	350,000	250,000	-30
Known.....	250,000	200,000	150,000	-20
Unknown.....	150,000	150,000	100,000	-35
Inactive cases.....	800,000	600,000	550,000	-10
Known.....	250,000	250,000	250,000	0
Unknown.....	550,000	350,000	300,000	-15
Persons who once had tuberculosis.....		1,050,000	1,200,000	+15
Total cases plus persons who once had tuberculosis.....		2,000,000	2,000,000	0

¹ All estimates rounded to the nearest 50,000.

² Adjusted according to information available since publication of the 1952 estimates.

³ Percent changes were computed from the 1952 adjusted estimates and the 1956 estimates before any rounding. Percentages rounded to the nearest 5 percent. The basic data available for arriving at these estimates are not precise enough to lend confidence to small differences resulting from further manipulation of these figures.

Figure 1. Hospitalization status of known active cases, 1952 and 1956



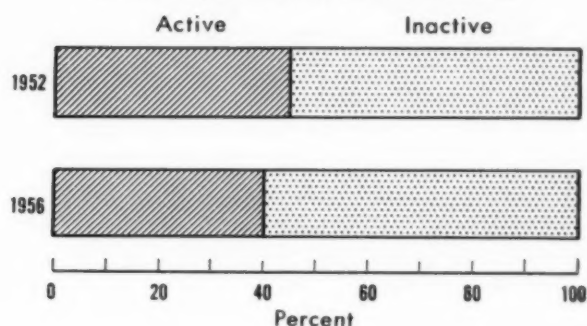
culosis); (b) clinically active cases in mental and penal institutions; and (c) all cases clinically active at home and known to health departments.

The sources of the data for known cases were:

- The Public Health Service tuberculosis bed census of April 1, 1956, giving the number of tuberculosis beds occupied in all Federal and non-Federal hospitals, except mental and penal institutions, having facilities for treating tuberculosis.
- The Tuberculosis Hospital and Sanatorium Directory published in 1954 by the National Tuberculosis Association showing the number of tuberculosis beds in mental and penal institutions in 1953.
- Annual tuberculosis reports prepared by State health departments and submitted to the Public Health Service, showing the number of cases hospitalized and active cases at home.
- Tuberculosis case register summary reports received by the Public Health Service from State and local health departments, showing cases known to health departments (2).
- The nationwide nonhospitalized tuberculosis patient study conducted by the Tuberculosis Program of the Public Health Service in 1954 and 1955 (3, 4).
- Additional supplementary data, such as published reports of health departments.

The tuberculosis bed census includes data on all tuberculosis beds in the Nation, except those in mental and penal institutions. The 80,000 tuberculosis beds occupied as reported by the bed census may be taken as the total number of cases in all hospitals except mental and penal institutions. These data were substan-

Figure 2. Clinical status of all cases known to health departments, 1952 and 1956



tiated by other sources, including the Public Health Service annual tuberculosis reports. The number of tuberculosis beds in mental and penal institutions, shown in the National Tuberculosis Association Hospital and Sanatorium Directory for 1953, was 20,000. On the basis of information available, about 10,000 of these beds were estimated to be occupied by clinically active cases, raising the total active cases hospitalized to 90,000.

The estimate of known active cases at home was based on several sources which complement each other. Public Health Service annual tuberculosis reports from about three-quarters of the States provide material for apparently reliable estimates. The figures from these reports were substantiated by data from case register summary reports and other similar sources of information. The State reports were the source of about 70 percent of the new clinically active cases reported in 1954 and 1955, and about 73 percent of the deaths. The total active cases at home for the continental United States was obtained by projecting the total for the reporting States to a total for the United States. The basis for the projection was the assumption that the ratio of known active cases at home in these States to the national total of known active cases at home would be the same as the ratio of the new active cases reported in these States to the total reported for the United States.

The resulting estimate was adjusted for overstatement on the basis of the experience of case review in the nonhospitalized tuberculosis patient study. From 35 to 40 percent of the cases originally listed as active and at home

were found to be dead, hospitalized, moved away, lost, or no longer active, and therefore were removed from the list of active cases. A check of the cases classified as activity undetermined and a search of other records for more cases resulted in the addition of almost 10 percent to the active cases at home which remained after the review of the original list (4). The resulting net reduction was about 30 percent. When this adjustment was applied to the estimated figure for the national total, an estimate of 60,000 active cases at home was obtained.

When added to the 90,000 cases hospitalized, these 60,000 nonhospitalized active cases gave an estimated total of 150,000 known active tuberculosis cases in 1956. This estimate was substantiated by other data. For example, the proportion of known active cases hospitalized, approximately 60 percent, was the same proportion as was found independently in the non-hospitalized patient study.

The experience of the nonhospitalized patient study conducted in 1954 and 1955, showing that case registers overstated the number of active cases at home, is as applicable to 1952 data as to 1956 data. Accordingly, the same adjustment that was made in the 1956 estimate of known active cases at home was applied to the 1952 estimate. This resulted in a revised 1952 estimate of 200,000 known active cases in the continental United States. This figure is comparable to the 1956 figure.

Unknown Active Cases

To estimate the number of unknown cases of tuberculosis in the population in 1952, the results of communitywide chest X-ray surveys were used. Since the chest X-ray survey still seemed to be the best yardstick for measuring unknown prevalence, the Public Health Service regional offices were asked in 1956 to gather results of recent chest X-ray surveys in their jurisdictions. Survey reports were received from 42 States and the District of Columbia, covering almost 14½ million X-ray examinations taken primarily during the years 1953, 1954, and 1955, in all kinds of screening programs. From these, reports were selected which gave information on the yield of com-

munitywide X-ray programs in cities, counties, and sometimes in entire States.

Added information was provided by data from the Veterans Administration, where it was the policy to give X-ray examinations routinely to all patients admitted to veterans hospitals and clinics as well as to hospital personnel caring for these patients. This program screened 5,250,000 persons from 1950 to 1955.

Summary and analysis of pertinent data from all sources indicated that the discovery rate of unknown active tuberculosis was nearly 0.7 cases per 1,000 X-ray examinations in community surveys in 1956. Since the equivalent rate was 1 per 1,000 in 1952, the prevalence of unknown active tuberculosis appears to have decreased between 30 and 40 percent from 1952 to 1956.

In 1956, there were about 117 million persons 15 years of age and over in the United States. Using the rate of 0.7 cases per 1,000 X-rays taken, there would be 80,000 unknown cases of active tuberculosis among the adult population in the country in 1956. Additional consideration must be given to other factors. First, community X-ray surveys tend to miss certain groups with high tuberculosis prevalence. One of the more sizable of these is the older age group. Response to the survey from persons 55 years of age and older is usually considerably less than for the age groups from 15 to 54. As response decreases with age, prevalence of active tuberculosis, particularly among males, increases with age. Second, the survey appeal is not generally directed toward children under 15 years of age. Cases of tuberculosis do occur among children but not in sufficient numbers to warrant their inclusion in communitywide programs.

In order to compensate primarily for the active tuberculosis missed in these two groups, it was determined on the basis of probable prevalence in the groups that an additional 20,000 cases should be added, resulting in an estimate of 100,000 unknown active tuberculosis cases in 1956.

Inactive Cases

Known inactive cases are defined as those cases which are clinically inactive and are currently reported to be under supervision by local

health departments. They include cases on drug therapy as well as other inactive cases significant for public health supervision, according to local health department standards. The only available sources of data are tuberculosis case register summary reports received from 1954 through 1956 from State and local health departments representing about one-sixth of the population of the continental United States.

Analysis of the case register reports indicates that on the average there are at least one and a half times as many inactive cases on the register as active. The experience of Public Health Service records consultants working with State and local health departments confirms this finding. It is therefore estimated that there were about 250,000 known inactive cases in 1956.

Unknown inactive cases are defined as those cases which are clinically inactive and currently need public health supervision, but are not known to the local health agency. A number of these cases may have been previously reported and later lost to supervision. The chest X-ray survey reports received from States and local areas were, to a great extent, inadequate in the reporting of inactive tuberculosis discovered in X-ray case-finding programs. The most complete data in the discovery of inactive tuberculosis were those from the Veterans Administration case-finding program.

From an analysis of all data available, it was estimated that tuberculosis case-finding programs yield between 3 and 4 unknown cases of inactive tuberculosis for every unknown active case discovered. An estimate of 300,000 unknown inactive cases significant for public health supervision in 1956 was made on the basis of this observation.

The present definition of unknown inactive tuberculosis is not strictly comparable with the definition used in arriving at the 1952 prevalence estimate. The 1952 estimate included some inactive cases that were not, at that time, significant for public health supervision. In 1952 it was estimated that there were 550,000 "important" undiscovered inactive cases. Of these it is estimated that 350,000 would have been classified as unknown inactive cases significant for public health supervision according to the 1956 definition.

Persons Who Once Had Active Tuberculosis

The data for the estimate of once active cases were more limited than the data for the other categories. As described above, estimates of known active and inactive cases were based largely on actual counts of cases hospitalized or known to health departments. Estimates of unknown active and inactive cases were based chiefly on yields of X-ray surveys. However, the estimate of persons not now requiring public health supervision was obtained by estimating the total number of persons who have or have had tuberculosis and then subtracting the estimate of all known and unknown active and inactive cases.

The estimated number of persons who have or have had tuberculosis for 1952 consisted of the 1,200,000 "important" cases estimated at that time (1) plus an additional 800,000 persons. This estimate of 800,000 is based on X-ray survey findings of cases classified as "tuberculosis—no followup necessary." The number of these persons not now requiring public health supervision was obtained by subtracting the revised estimate of 950,000 known and unknown, active and inactive cases in 1952 from the 2,000,000 total living persons who had ever had tuberculosis. The resulting figure was 1,050,000 persons not requiring public health supervision in 1952.

The 1956 estimate of the total number of cases plus the number of persons who once had tuberculosis was calculated by starting with the 1952 estimate and adding estimated tuberculosis incidence and subtracting estimated deaths from all causes in the tuberculous population between 1952 and 1956. Since the number of persons leaving the tuberculous population because of deaths from all causes was about the same as the number of new cases, the number of living persons who have or ever have had tuberculosis has remained approximately the same. Subtracting the 250,000 active cases and the 550,000 inactive cases from the estimate of 2,000,000 yields the estimate of 1,200,000 persons who once had tuberculosis but did not require public health supervision in 1956.

Conclusion

If present trends persist, the number of active and inactive tuberculosis cases will continue to

decline. This decline will be the consequence of the continuing decrease in incidence and the increasing recovery rate.

The number of persons who have once had tuberculosis will probably begin to decline in the years immediately ahead. This group of persons who once had tuberculosis is composed largely of older persons, and it can be expected that deaths from all causes will deplete this group more rapidly than the rate of entry of newly recovered cases will enlarge it.

REFERENCES

- (1) Prevalence of tuberculosis in the United States. *Pub. Health Rep.* 67: 766, August 1952.
- (2) Enterline, P. E., and Sauer, H. I.: Community-wide chest X-ray survey. VI. Records and reports. *Pub. Health Rep.* 66: 1613-1624, Dec. 7, 1951.
- (3) Blomquist, E. T.: The nonhospitalized tuberculous patient. *Am. J. Pub. Health* 46: 149-155, February 1956.
- (4) Anderson, R. J., Sauer, H. I., Smith, V. B., and Roberts, D. E.: The nonhospitalized tuberculous patient. *Pub. Health Rep.* 71: 888-896, September 1956.

Porterfield Appointed Deputy Surgeon General



Dr. John D. Porterfield has been named Deputy Surgeon General of the Public Health Service, succeeding Dr. W. Palmer Dearing, who is now assistant director for health in the Office of Defense Mobilization.

Dr. Porterfield, a career officer of the Public Health Service, has been an Assistant Surgeon General since March 1957. His previous post of assistant to the Surgeon General was assumed in October 1956, following service as director of the Ohio Department of Mental Hygiene and Correction since 1954, and before that, as director of the Ohio Department of Health since 1947.

Dr. Porterfield entered the Service's Commissioned Corps in 1939, and in 1946 he took part in the early development of the Research Grants Program at the National Institutes of Health.

Dr. Porterfield is a fellow of the American

Medical Association and of the American Public Health Association, in which he has held a number of posts including current membership on the executive board. President of the Middle States Public Health Association in 1956-57 and formerly secretary and vice president of the Association of State and Territorial Health Officers, Dr. Porterfield is a past regent of the American College of Preventive Medicine.

Dr. Porterfield has been on the faculties of Ohio State University College of Medicine, the University of Michigan School of Public Health, and the Cincinnati College of Medicine.

The new Deputy Surgeon General, who is the fifth generation of physicians in the Porterfield family, is a graduate of the University of Notre Dame. He received his medical degree from Rush Medical College of the University of Chicago, and his master's degree in public health from the Johns Hopkins University School of Hygiene and Public Health.

Results of screening serologic reactors found during an intensive house-to-house survey in New York City demonstrate the value of multiphasic screening procedures in suspect neighborhoods.

House-to-House Serologic Survey With Multiphasic Screening

THEODORE ROSENTHAL, M.D., and JULES E. VANDOW, M.D.

DURING the 10-week period April 18–June 25, 1955, the New York City Health Department conducted, with the cooperation of the Public Health Service, an intensive house-to-house blood testing program in the Central and East Harlem Health Districts of Manhattan. The Central Harlem Health District was selected for testing because of the known high prevalence of syphilis. This district reported 22.5 percent of all the syphilis cases in New York City in 1953 and 20.5 percent in 1954. Furthermore, the mass blood testing street survey of 1953 indicated that about 20,000 residents of this district were in need of antisyphilitic therapy. The East Harlem Health District was included in the 1955 intensive survey because it is contiguous to Central Harlem and is the fifth area in the city in syphilis prevalence, having reported 6.8 percent of the cases in 1953 and 6.3 percent in 1954. At least 2,000 persons in this district were in need of antisyphilitic treatment, according to the 1953 mass street survey.

A house-to-house serologic survey in Newark in 1954 demonstrated the special value of this type of survey (1). By concentrating on an

area of known high prevalence and proceeding systematically from house to house, and from street to street, it is possible to test more people for less money than in street surveys. A higher yield of cases of syphilis brought to treatment may also be expected.

In the 10 weeks of the survey, 23,675 persons were tested for syphilis. Testing was done in three health areas of Central Harlem and in areas 20, 25, and 29 of East Harlem. This was accomplished by 4 teams, each composed of a technician who drew the blood and a clerk who kept the records. Two teams and a publicity agent worked as a unit on a particular street. First, the publicity agent alerted the residents by personal contact, by handbills, and by posters placed in neighborhood stores. On the following day, the 2 teams began their testing, proceeding methodically from house to house. In this manner, about 400 specimens of blood were collected daily and forwarded to the health department's bureau of laboratories for serologic examination. The reports were transmitted to the division of social hygiene. Negative reports were promptly mailed to patients. Positive and doubtful reports were checked against the health department's syphilis registry to separate reactors with a previous record from others. Letters were then mailed to all reactors advising that further examinations

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should be done by their own physicians or by health department clinics. Home visits were made to those who failed to report after 1 week.

Results of Blood Testing

Of the 23,675 persons tested, 6,701 were white, 14,872 were nonwhite, and 2,102 were classified as "other." The total number included 8,739 Puerto Ricans, of whom 5,978 were classified as white, 917 as nonwhite, and 1,844 as "other." "Other" Puerto Ricans are those who could not readily be classified as either white or nonwhite. Also included in this group were 258 non-Puerto Ricans of undetermined race.

The laboratory reported a total of 3,406 abnormal serologic reactions, an overall STS reactivity rate of 14.4 percent. This does not include an estimated 10 percent who had positive Mazzini reactions which were not confirmed by Kolmer or VDRL tests. Of the 3,406 abnormal serologic reactions, 2,131 were positive and 1,275 were doubtful. The reactivity rate for nonwhites was 17.6 percent, for nonwhite Puerto Ricans 11.3 percent, for white Puerto Ricans 9.2 percent, for "other" Puerto Ricans 12.9 percent, and for "other" whites 4.0 percent.

The number and percentage of abnormal blood tests found in the survey are shown by age and sex in table 1. The percentage of abnormal reactions increases for both sexes in each succeeding age decade. Abnormal reactions in males increased from 3.9 percent in the 15-24

year age group to 25.5 percent in the 55 years and over age group. Abnormal reactions in females increased from 5.6 percent in the 15-24 year age group to 18.4 percent in the 55 years and over age group.

Results of Successive Screening

The final results of screening the reactors are shown according to race in table 2. Of the 3,406 reactors to the initial STS, 2,345 (68.8 percent) reported to the clinic or private physician for further examinations. As a result, 1,918 individuals were found to have syphilis. This was 81.8 percent of those examined and 8.1 percent of those originally tested. Of the individuals with syphilis, 1,317, or 56.1 percent of the 2,345 reactors examined, were in need of treatment.

Although most of the white persons tested in the survey were Puerto Ricans, in this study they have been considered together with nonwhites and "other" Puerto Ricans. In a group of 723 white persons, not Puerto Ricans, residing in the Harlem area, a reactivity rate of 4.0 percent was found. The 13 cases of syphilis discovered made up 1.8 percent of the 723 persons tested.

In the entire group of 1,918 individuals with syphilis, 406 were new cases, 911 were cases requiring further treatment, and 601 were cases which had already received adequate treatment. When this was related to the total of 23,675 persons tested, it was found that 1.7 percent had

Table 1. Number and percentage of positive and doubtful blood tests for syphilis, by age and sex, house-to-house survey, New York City, 1955

Age	Total			Male			Female		
	Number tested	Positive and doubtful		Number tested	Positive and doubtful		Number tested	Positive and doubtful	
		Number	Percent		Number	Percent		Number	Percent
All ages	23, 675	3, 406	14. 4	11, 810	1, 797	15. 2	11, 865	1, 609	13. 6
10-14	327	6	1. 8	144	3	2. 1	183	3	1. 6
15-24	5, 330	248	4. 7	2, 933	113	3. 9	2, 397	135	5. 6
25-34	6, 868	882	12. 8	3, 282	413	12. 6	3, 586	469	13. 1
35-44	5, 469	1, 061	19. 4	2, 667	571	21. 4	2, 802	490	17. 5
45-54	3, 378	712	21. 1	1, 670	416	24. 9	1, 708	296	17. 3
55 and over	2, 251	491	21. 8	1, 088	277	25. 5	1, 163	214	18. 4
Age unknown	52	6	11. 5	26	4	15. 4	26	2	7. 7

Table 2. Results of successive screening, house-to-house survey, New York City, 1955

Category	Number tested	STS reactors		STS reactors examined		Cases of syphilis found		
		Number	Percent of number tested	Number	Percent of reactors	Number	Percent of STS reactors examined	Percent of total number tested
White.....	723	29	4.0	18	62.1	13	72.2	1.8
Nonwhite.....	13,955	2,453	17.6	1,636	66.7	1,433	87.6	10.3
Puerto Rican ¹	8,997	924	10.3	691	74.8	472	68.3	5.2
Total.....	23,675	3,406	14.4	2,345	68.8	1,918	81.8	8.1

¹ Includes 5,978 white and 917 nonwhite Puerto Ricans; also 1,844 Puerto Ricans and 258 non-Puerto Ricans of undetermined category.

Table 3. Number and percentage of positive and doubtful blood tests among whites and nonwhites, by age and sex, house-to-house survey, New York City, 1955

Age	White						Nonwhite					
	Male			Female			Male			Female		
	Number tested	Positive and doubtful		Number tested	Positive and doubtful		Total tested	Positive and doubtful		Total tested	Positive and doubtful	
		Num-ber	Per-cent		Num-ber	Per-cent		Num-ber	Per-cent		Num-ber	Per-cent
All ages.....	475	16	3.4	248	13	5.2	7,112	1,320	18.6	6,843	1,133	16.6
10-14.....	3		.0	3		.0	53	1	1.9	54	1	1.9
15-24.....	77		.0	37		.0	1,324	47	3.5	1,213	77	6.3
25-34.....	102	4	3.9	60	2	3.3	2,089	293	14.0	2,214	346	15.6
35-44.....	90	1	1.1	52	5	9.6	1,818	439	24.1	1,658	353	21.3
45-54.....	94	5	5.3	43	2	4.7	1,110	313	28.2	1,025	224	21.9
55 and over.....	108	6	5.6	51	4	7.8	704	223	31.7	665	131	19.7
Unknown.....	1		.0	2		.0	14	4	28.6	14	1	7.1

newly discovered syphilis, and 3.8 percent had syphilis requiring additional treatment. Thus 5.5 percent of the total number tested were in need of treatment. The 406 new cases of syphilis were diagnosed as follows: primary 1, secondary 7, early latent 34, late and late latent 353, and congenital 11.

Nonwhite Population Tested

A total of 13,955 nonwhites were tested in the survey (table 2). Positive or doubtful serologic reactions occurred in 2,453, or 17.6 percent. The reactivity rate, lowest in the 10-14 year age group (1.9 percent), rose in each successively

older group, until it reached the high level of 25.9 in the 55 years and over age group (table 3). In general, males had a slightly higher rate than females, 18.6 percent compared with 16.6 percent. However, the rate for females was somewhat higher than for males in the 15-24 and 25-34 year age groups dropping below the rate for males after 35 years.

Among the 1,433 cases of syphilis found in the nonwhite reactors examined, 313 had syphilis never previously treated, 681 had syphilis requiring further treatment, and 439 had syphilis requiring no additional treatment. Thus, of the 13,955 nonwhites tested, 2.2 percent had newly discovered syphilis and 4.9 percent had

Table 4. Number and percentage of positive and doubtful blood tests among Puerto Ricans, by age and sex, house-to-house survey, New York City, 1955

Age	White						Nonwhite						Other (category undetermined) ¹					
	Male			Female			Male			Female			Male			Female		
	Number tested	Positive and doubtful		Number tested	Positive and doubtful		Number tested	Positive and doubtful		Number tested	Positive and doubtful		Number tested	Positive and doubtful		Number tested	Positive and doubtful	
		Number	Percent		Number	Percent		Number	Percent		Number	Percent		Number	Percent		Number	Percent
All ages	2, 830	303	10. 7	3, 148	246	7. 8	431	47	10. 9	486	57	11. 7	962	111	11. 5	1, 140	160	14. 0
10-14	66	1	1. 5	74	1	1. 4	6	—	. 0	24	—	. 0	16	1	6. 3	28	1	3. 6
15-24	1, 023	48	4. 6	792	28	3. 5	183	3	1. 6	95	4	4. 2	326	15	4. 6	260	26	10. 0
25-34	732	75	10. 2	888	68	7. 7	112	12	10. 7	122	17	13. 9	247	29	11. 7	302	36	11. 9
35-44	497	80	16. 1	696	68	9. 8	69	17	24. 6	110	16	14. 5	193	34	17. 6	286	48	16. 8
45-54	301	63	20. 9	408	35	8. 6	40	12	30. 0	77	9	11. 7	125	23	18. 4	155	26	16. 8
55 and over	202	36	17. 8	285	46	16. 1	19	3	15. 8	55	10	18. 2	55	9	16. 4	107	23	21. 5
Age unknown	9	—	. 0	5	—	. 0	2	—	. 0	3	1	33. 3	—	—	. 0	2	—	. 0

¹ Includes 258 non-Puerto Ricans of undetermined category.

syphilis requiring further treatment. The 994 individuals with syphilis brought to treatment because of the survey represent 7.1 percent of those originally tested.

Population estimates by race and age are not available for 1955. However, the estimated population of the Central Harlem District, as of July 1, 1955, does not differ markedly from the census enumeration, 250,000 in 1955 compared with 259,594 in 1950, of whom 222,033 were 10 years old or older. Data from the 1950 Federal census are therefore utilized in the following computations.

According to the 1950 census, about 66,089 persons over 10 years of age reside in the three health areas of Central Harlem that were tested. The survey tested 18.5 percent of these and about 5.5 percent of the entire district. About 95 percent of the residents of Central Harlem are nonwhite. By applying the syphilis rates for nonwhites found in the survey, it is estimated that 1,454 persons with undiscovered syphilis reside in these areas. The survey found 313 of these, leaving 1,141 still undiscovered. Similarly, it is estimated that 3,238 persons with syphilis requiring further treatment reside in these areas. The survey

found 681 of these, leaving 2,557 still undiscovered. From this it is apparent that the survey succeeded in finding only about one-fifth of the syphilitics requiring treatment in these health areas.

By applying the same percentages to the entire population over age 10 of the Central Harlem Health District and deducting the cases found in the survey, it is estimated that there are 4,572 undiscovered syphilitics and 10,199 syphilitics requiring further treatment, or altogether a total of 14,771. This emphasizes the need for continued serologic surveying, education, and vigilant venereal disease control effort.

Puerto Rican Population Tested

Morbidity data do not furnish accurate information regarding the incidence of syphilis among Puerto Ricans in New York City (2). For this reason an attempt was made to obtain this information by including a question as to national origin on the report form used in the survey.

Altogether, 8,997 Puerto Ricans over age 10 were tested and 924, or 10.3 percent, had posi-

tive or doubtful blood tests (table 2). About three-quarters of these reactors reported for examination, and syphilis was discovered in 472, or 68.3 percent of the reactors examined, and this was 5.2 percent of the 8,997 Puerto Ricans tested. Of the Puerto Ricans tested, new cases of syphilis were found in 1.0 percent, cases requiring additional treatment in 2.5 percent, and 1.6 percent were cases that had already received adequate treatment. Thus, 3.5 percent of Puerto Ricans tested in the survey had syphilis requiring treatment.

Syphilis was only half as prevalent among the Puerto Ricans tested as among the nonwhites tested. Of interest was the finding that on the basis of available evidence reactions to serologic tests for syphilis were considered as false positive in 31.7 percent of the Puerto Rican reactors. This was almost three times the percentage of false positive tests found in the indigenous nonwhite group. These apparent differences warrant further study with the newer laboratory procedures which utilize specific antigen.

Table 4 gives the number and percentage of positive and doubtful blood tests by age, sex, and race. The reactivity rate for the white Puerto Ricans was 9.2 percent; 10.7 percent for males and 7.8 percent for females. The rate increased with age and was highest in the 55 years and over age group. The reactivity rate for nonwhite Puerto Ricans was 11.3 percent; 10.9 percent for males and 11.7 percent for females. The reactivity rate for "other" Puerto Ricans was 12.9 percent; 11.5 percent for males and 14.0 percent for females. A small number of indigenous individuals of undetermined ancestry could not be separated from the Puerto Ricans of undetermined ancestry. These two groups, 1,844 Puerto Ricans and 258 non-Puerto Ricans are combined in the table. As with white and nonwhite Puerto Ricans, the reactivity rates increased with age.

Of the 87 new cases of syphilis found among Puerto Ricans, 2 were secondary, 8 were early latent, 72 were late latent, and 5 were congenital syphilis.

An accurate estimate of the potential number of STS reactors and cases of syphilis in the population of the entire East Harlem Health District is difficult to make from the data avail-

able from the survey. This is because the population is not as homogeneous as in the Central Harlem district, and because of inadequate sampling. An estimate will therefore be made only for areas 20 and 25 of the East Harlem Health District where, with the exception of 605 specimens taken in area 29, practically all of the tests were done.

The population of areas 20 and 25 is almost entirely Puerto Rican. According to the 1950 census, there are 44,200 persons over age 10 residing in these areas. In the survey, approximately one-fifth of the residents over age 10 were tested for syphilis. Assuming that the same percentages of syphilis in Puerto Ricans found in the survey held for the entire population in these areas, it may be estimated that there are 355 cases of undiscovered syphilis and 880 cases of syphilis requiring additional treatment, a total of 1,235 cases in need of antisyphilitic therapy.

Multiphasic Screening of Reactors

Of the 3,406 persons with positive blood tests in the survey, 2,116 reported to the health department clinic and underwent a multiphasic screening procedure. This included a complete physical examination, repetition of the blood test, genital smears for gonorrhea (done routinely in women and only when indicated in men), a urine examination for sugar, and an X-ray of the chest. Papanicolaou smears of the cervical secretions in 1,011 female reactors over 21 years of age were also obtained. These were

Table 5. Results of multiphasic screening of serologic reactors, house-to-house survey, New York City, 1955

Condition	Number reactors screened	New cases found	
		Number	Percent
Syphilis ¹	2, 116	344	16. 3
Gonorrhea.....	2, 116	18	. 8
Diabetes.....	2, 116	23	1. 0
Carcinoma of cervix.....	1, 011	13	1. 3
Chest disease.....	(²)	23	-----

¹ New cases. An additional 62 new cases were found by private physicians and other clinics.

² Number of individuals X-rayed was not determined. (See text.)

examined by the cancer detection service of the bureau of adult hygiene.

As a result of these procedures, the following conditions were discovered:

Veneral disease

Syphilis:

Number new cases.....	344
Number cases requiring additional treatment.....	848
Number cases not requiring additional treatment.....	564
Gonorrhea (females 16, males 2).....	18
Nongonococcal urethritis.....	1

Glycosuria

Number individuals with glycosuria.....	60
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Diabetes:

Previously known.....	23
Under treatment.....	13
Returned to treatment.....	10
Not previously known.....	23
Excluded on reexamination.....	6
Failed to return for reexamination.....	8

Abnormal chest findings by X-ray

Tuberculosis:

Active.....	3
Arrested.....	2
Cured.....	3
Type not disclosed.....	1
Stage undetermined.....	1
Suspicious.....	1

Pneumonitis.....	1
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Cystic disease of lungs.....	1
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Aneurysm.....	5
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Enlarged heart.....	5
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Abnormal Papanicolaou smears

Squamous cell carcinoma in situ.....	12
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Invasive squamous cell carcinoma.....	1
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Suspicious, still under study.....	6
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Chronic endocervicitis with squamous metaplasia, still under study.....	3
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Chronic endocervicitis.....	7
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Cervical polyp.....	1
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Table 5 gives the number and percentage of new cases of syphilis, gonorrhea, diabetes, carcinoma of the cervix, and chest disease found in the survey. The large number of syphilis cases was to be expected since the individuals examined were all serologic reactors. The 16 cases of gonorrhea in women were asymptomatic. The 23 new diabetics found were referred to hospital clinics and private physicians who confirmed the diagnosis with blood sugar determinations. In addition, 10 known diabetics who were not under medical care were referred for further examination and treat-

ment. The 13 women with carcinoma of the cervix had biopsies which confirmed the diagnosis made by examination of the Papanicolaou smears. All were referred for surgical treatment. Patients with lung or heart disease were also referred for appropriate treatment of their condition.

These results confirm the value of multiphasic screening procedures in areas where the population is predominantly nonwhite. Since this was primarily a syphilis case-finding project, arrangements could not be made for the multiphasic screening of individuals who did not react to the initial blood test. The data indicate that a broader type of survey would have yielded many more cases of diabetes, chest disease, and cancer.

Summary

1. A house-to-house blood testing survey was conducted by the New York City Health Department in the Harlem section of Manhattan over a 10-week period during the spring of 1955.

2. A total of 23,675 persons were tested. These included 14,872 nonwhites, 6,701 whites, and 2,102 "others." The STS reactivity rate for the entire group was 14.4 percent.

3. Syphilis was found in 1,918 individuals, 8.1 percent of those tested; 406 were new cases, 911 were cases requiring further treatment, and 601 cases had been adequately treated.

4. Syphilis was found to be twice as prevalent in nonwhites as in the Puerto Ricans tested.

5. Reactions to serologic tests for syphilis (STS) considered as false-positive apparently occurred in 31.7 percent of the Puerto Rican reactors, three times the percentage found in the nonwhite group.

6. Of the STS reactors of all categories examined, 81.8 percent had syphilis and 56.1 percent were in need of treatment.

7. It is estimated that there are 14,771 nonwhites in the Central Harlem District who are in need of antisyphilitic treatment. Similarly it is estimated that in two areas of East Harlem that were tested there are 1,235 Puerto Ricans in need of antisyphilitic treatment.

8. Multiphasic screening of the reactors resulted in finding 18 persons with gonorrhea, 23

with previously unknown diabetes, 13 women with squamous cell carcinoma of the cervix, 3 persons with active pulmonary tuberculosis, and 20 persons with evidence of heart or lung conditions. These results confirm the value of utilizing multiphasic screening procedures in suspect neighborhoods.

REFERENCES

- (1) Shepard, A. C.: 19,963 given serologic tests in Newark casefinding effort. *Pub. Health News*, New Jersey Health Department 37: 26-28, January 1956.
- (2) Vandow, J. E.: Venereal disease among Puerto Ricans in New York City. *Pub. Health Rep.* 70: 1242-1246, December 1955.

Traineeships in Neurological and Sensory Disorders

A new program of grants to research scientists for advanced training in neurological and sensory disorders has been announced by the National Institute of Neurological Diseases and Blindness, Public Health Service. The awards are designed to help research scientists obtain additional specialized training for careers in teaching and research.

A previous program, under which about 75 scientists received advanced training in 1957, was concerned only with clinical training. The current program encourages advanced training in either the clinical field or in such basic science areas as neurochemistry, neuropharmacology, neurophysiology, or neuroanatomy.

The traineeships may be awarded for study at any institution in the United States or abroad qualified to give the particular training desired. During training, which may begin within 10 months of the date of the award, the trainee will not be permitted to carry on the private practice of medicine.

Generally, the awards will be made for not less than 9 months and for not more than a year. They may be renewed, however, and in this way may continue up to a period of 3 years. Stipends range from \$5,500 to \$14,800 a year, according to the applicant's qualifications and training needs.

Applicants must be citizens of the United States or must have filed declarations of intent to become citizens. They must be free of any disability that would interfere with the proposed training. In addition, they must have completed either the residency in a clinical specialty, or its equivalent, or at least 3 years of pertinent postdoctoral training or research experience.

Application forms and instructions may be obtained by writing to the Chief, Extramural Programs Branch, National Institute of Neurological Diseases and Blindness, National Institutes of Health, Public Health Service, Bethesda 14, Md.

Long-Acting Penicillin in Gonorrhea Control

MICHAEL J. TAKOS, M.D., M.P.H., LEE W. ELGIN, M.D., and T. ELAM CATO, M.D., M.P.H.

PREVENTION of the spread of gonorrhea from one person to another is one of the most difficult problems in venereal disease control. Individuals acquiring gonorrhea can spread the disease after only a brief incubation period. Unlike syphilis, there are no long periods when it is virtually impossible to transmit the disease.

The principal factor behind the difficulty in controlling gonorrhea is that the infected female is usually completely unaware that she has an infectious disease. Unpublished studies of 318 women with laboratory proved diagnoses of gonorrhea infection at the Dade County Venereal Disease Control Clinics showed that only 22 (6.9 percent) came to the clinics because they themselves were aware that they were infected. Of this group, 12 reported on questioning that they did not know they had this disease until they were so informed by their latest sexual partners. Thus, only 10 females, or 3.1 percent of the group studied, had developed symptoms of sufficient severity to cause them to seek medical assistance. In contrast, of 711 males

studied, 701, or 98.6 percent, came into the clinics voluntarily because they knew they were infected.

Adding to the difficulties of gonorrhea control is the fact that our present laboratory methods of demonstrating neisserian infection in the female by smear and culture techniques are not very effective. Furthermore, the clinical diagnosis of uncomplicated gonorrheal infection in the female is quite difficult. Thus, the male urethra still remains the most effective culture and diagnostic medium known for indicating which women in the population are harboring the gonococcus.

Methods

Consideration of these epidemiological facts led to a change in the gonorrhea control program of the venereal disease control clinics in an attempt to decrease the the rate of spread of the disease in Dade County, Fla.

All female contacts of male gonorrhea patients at the clinics who came within the jurisdiction of the health department were treated with 2.4 million units of benzathine penicillin G (Bicillin). This dosage was given in divided doses of 4 cc. (1.2 million units) in each buttock. Studies by various investigators have shown that this procedure allows the maintenance of effective therapeutic blood levels of penicillin for at least 6 weeks (1-3). The objective of this therapy was to cure the patients of their neisserian infection, and, at the same time, to protect them from reinfection by the gonococcus for approximately 6 weeks. Thus, we would create an interlude during which women al-

This paper is a joint contribution of the Dade County Health Department and the section of preventive medicine, University of Miami School of Medicine, Miami, Fla. The authors are all members of the Dade County Health Department. Dr. Takos, formerly head of the venereal disease control division, is now in charge of the research and special studies division; Dr. Elgin is the present head of the venereal disease control division; and Dr. Cato is the health commissioner. Dr. Takos and Dr. Cato are also instructors in preventive medicine, University of Miami School of Medicine.

ready known to have been infected would not be able quickly to reacquire the disease and so continue to spread it in the community. It seemed reasonable to assume that those women who already had gonorrhea were those most likely to get it again. This assumption is borne out by the data from our studies of 318 women with neisserian infections. Of this group, 93 (29.2 percent) had previous diagnoses of gonorrhea infection on the clinic records.

In the clinics, we continued to treat male gonorrhea patients with the previously used standard therapy of 600,000 units of 72-hour repository penicillin (aqueous procaine penicillin G with aluminum monostearate). This had been our standard therapy in the past for both males and females. The males were cured within a week and could be reinfected by the gonococcus as soon as the therapeutic blood level of penicillin disappeared. Our objective was to continue using the males as a medium through which to find the infected female reservoirs of neisserian disease in the population. Possibly the total number of individuals infected with the gonococcus could have been sharply reduced by using Bicillin therapy for both males and females since nearly 44 percent of our male patients become reinfected in less than 6 months. But this technique would also have eliminated the best method now available for locating females with gonorrhea.

Table 1. Total laboratory-proved gonorrhea cases treated at Dade County, Fla., clinics, 1953-56

Month	1953	1954	1955	1956
January	142	194	147	119
February	118	200	108	122
March	143	196	133	114
April	165	177	128	108
May	167	155	127	145
June	186	¹ 159	149	112
July	196	146	129	148
August	169	152	168	128
September	158	137	156	118
October	178	165	136	162
November	172	160	127	89
December	185	121	126	99
Total	1,979	1,962	1,634	1,464
Mean cases per month	164.9	163.3	136.1	122.0

¹ Benzathine penicillin program started.

Table 2. Total gonorrhea cases in Florida metropolitan areas before and after period of use of benzathine penicillin in Miami, January 1954-February 1955

Month	Miami	Jacksonville	Tampa
Prior to benzathine penicillin program			
1954			
January	171	99	67
February	163	78	67
March	119	92	94
April	182	83	103
May	163	120	73
Total cases	798	472	404
Mean cases per month	159.6	94.4	80.8
After benzathine penicillin program			
June	115	110	80
July	113	72	112
August	115	156	62
September	123	107	87
October	170	128	119
November	117	71	64
December	138	178	73
1955			
January	103	56	65
February	104	158	72
Total	1,098	1,036	734
Mean cases per month	122.0	115.1	81.6

The Bicillin program was begun in June 1954 at all of the venereal disease control clinics in Dade County. During the first 2 months, smears and cultures were run once a week for 3 weeks on the females treated with Bicillin to check the effectiveness of the method. Of 48 women whom we were able to follow for 3 successive weeks, none had positive smears or cultures. Hookings and Graves (4) have reported similar results from their studies in Tennessee.

In Dade County, we use a modified "speed-zone" system of epidemiological tracing of the contacts of gonorrhea patients; because of the highly mobile nature of our population, we do not discontinue contact tracing until several months after a contact is first reported. Other than the use of benzathine penicillin, the only new factor added to our routine is a firm policy of refusing to treat male gonorrhea patients with long clinic records who would not or had

not furnished us with the names of traceable female contacts. However, this procedure had been in unofficial use for some time prior to June 1954. We reported to the central registry unit of the Florida State Board of Health all cases diagnosed but not treated.

Results

Once the program had a good start, we expected to see a falling off of the number of proved gonorrhea cases treated at the venereal disease control clinics. Proved gonorrhea cases are those having either positive smears or cultures, or both. Female contacts of males with gonorrhea are not considered cases unless positive laboratory evidence is obtained. This expectation was promptly borne out by the total number of proved gonorrhea cases coming to therapy at the clinics (table 1). The first 6 months of 1954 averaged 180.1 cases of gonorrhea per month treated at the clinics, while the last 6 months averaged only 146.8 cases per month. So a decrease in the number of cases of gonorrhea did occur shortly after benzathine penicillin began to be used and has continued during succeeding years.

One factor which had to be considered was the possibility that the evident decrease in the number of gonorrhea cases was artificial due to some statistical factor other than the Bicillin program. To help eliminate serious consideration of this point, the venereal disease control regis-

try unit of the Florida State Board of Health was asked to send us all monthly records of gonorrhea cases reported by clinics and private practitioners from within the city limits of Miami, Jacksonville, and Tampa, the three largest metropolitan centers in the State. Benzathine penicillin was not used in the venereal disease clinics in Jacksonville or Tampa during the period for which data are presented in table 2. These data show a marked falling off in the incidence of gonorrhea cases in the Miami area during a period when the incidence became higher in Jacksonville and showed no significant change in Tampa. These figures have been checked through Student's *t* test and are significant (table 3).

The best indication of the effectiveness of a control program is its effects on the community rates for the disease in question. Table 4 presents the data on total gonorrhea cases reported from Dade County at venereal disease clinics and by private practitioners and gives the estimated permanent population of the area and the gonorrhea morbidity rates. The morbidity rate was 2.1 per 1,000 in 1956 and averaged 3.1 during 1952, 1953, and 1954. If the average rate for 1956 had been 3.1 per 1,000, we should have had 2,276 cases of gonorrhea rather than the 1,554 actually reported.

Another possible source of distortion of these data would be selective treatment of females by deliberately searching them out. This might result in a rate higher than that usually ob-

Table 3. Standard error of the difference of the means and probability of the data in table 2

	Miami	Jacksonville	Tampa
Standard error of mean difference	12.8	22.7	19.8
Student's <i>t</i>	2.9	0.9	0.04
Probability	0.02 > <i>p</i> > .01	<i>p</i> > 0.05	<i>p</i> > 0.05
Meaning	Significant 1:50 > <i>p</i> > 1:100	Not significant	Not significant

Small sample method (Student's *t*): Null hypothesis: the two samples are drawn from populations identical both as to mean and variance.

$$\text{Pooled estimate of variance } \hat{\sigma}^2 = \frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}$$

$$\text{Standard error for the difference of the means } \hat{\sigma}_w = \hat{\sigma} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$t = \frac{[\bar{x}_1 - \bar{x}_2]}{\hat{\sigma}_w}$$

SOURCE: Moroney, M. J.: Facts from figures. Rev. ed. Baltimore, Penguin Books, 1954, p. 227 and seq.

Table 4. Total gonorrhea cases, population, and gonorrhea morbidity rates, Dade County, Fla., 1952-56

Year	Total reported cases	Estimated population ¹	Rate per thousand
1956-----	1,554	734,142	2.1
1955-----	1,663	703,777	2.4
1954-----	2,030	658,460	3.1
1953-----	1,994	617,616	3.1
1952-----	1,808	576,772	3.1

¹ As calculated by vital statistics division, Dade County Health Department.

tained. Data from the Dade County clinics show that this has not occurred. During 1953, 30 percent of the proved gonorrhea cases were in females. This proportion of females to the total number of cases has varied between 30 and 35 percent during the entire period covered here. One other factor, not previously mentioned, was the possible effects of a shift in the population of this area toward a greater proportion of white than Negro residents. Since our clinic records show a ratio of 9 Negroes to 1 white with gonorrhea, any decrease in the proportion of Negroes in the resident population might well be expected to account for a decrease in gonorrhea rates. This has not occurred. In 1953, 13.1 percent of the resident population were Negroes; in 1956, 13.9 percent. Hence a decline in the gonorrhea rates took place during a period when the proportion of Negroes in the population showed a slight increase.

Treatment Failures

There have been six instances of treatment failure in females. Treatment is considered to be a failure when the female is reported as transmitting gonorrhea during a period within 6 weeks after receiving benzathine penicillin. In two of these cases, searching inquiry into dates of exposure showed that the patients had become infected and had transmitted the disease during the seventh week after receiving benzathine penicillin. One woman supposedly infected a sailor about 4 weeks after receiving benzathine penicillin. She was examined about a week later, and repeated smears and cultures were negative for gonococcus. This woman was

a prostitute and had had sexual congress with at least three customers during the same evening in which infection probably occurred in the sailor, who denied other exposure. It is possible that the man may have been infected by discharges of the other customers remaining in the vaginal vault. We do not know what happened in the other three cases, except that the infection was transmitted during the fifth week following benzathine penicillin therapy. Perhaps these women excreted penicillin faster than others or somehow failed to obtain the total dosage.

Discussion

A steady decline in the total incidence of gonorrhea in the Dade County area occurred after initiation of the program of using benzathine penicillin for the treatment of gonorrhea in females. Data are presented showing a reduction in the total numbers of infected persons coming to the venereal disease control clinics and in the general gonorrhea morbidity rates for the community. The number of cases declined in Miami during a time when the number of cases was not decreasing in other metropolitan areas of Florida.

The use of benzathine penicillin apparently creates a period when reinfection becomes virtually impossible for the female. It is also possible that long-acting penicillins may be more effective than our previously used therapy in obtaining a complete cure in the female with neisserian infection. Either or both of these explanations may be operating, but we do not have sufficient evidence to prove this point. Males are treated with short-acting penicillin in order that they may be used for locating gonorrhea-infected women in the population. Satisfactory results were obtained in the Dade County area, even though we used a modification of the "speed zone" epidemiology method of contact tracing.

To be effective, the long-acting penicillin method requires that a fairly large proportion of infected women be brought to treatment. In Dade County we locate nearly half of our proved female gonorrhea cases by routine smear and culture examinations of women and girls in the local jails, of health card applicants, and

of individuals coming to county maternity centers. Only about 35 percent of our laboratory-proved cases of gonorrhea in females are found through contact tracing. Female contacts of men with gonorrhea are treated with benzathine penicillin but are not counted as gonorrhea cases unless the diagnosis is confirmed by the laboratory studies.

It is hard to assay any difficulties produced by a drug in those who receive it. The massive doses of benzathine penicillin used in our clinics apparently did not produce any more allergic reactions in patients than did the smaller doses of short-acting penicillins. There were many complaints of pain in the buttocks after injection, and an occasional individual had some difficulty in walking after Bicillin therapy. None of these effects lasted more than 24 hours, and those affected were usually the highly excitable individuals.

Long-acting penicillin certainly does not offer a panacea for the immediate elimination of gon-

orrhea from a population. But it does offer a possibility for a slow, steady decline which may eventually decrease the numbers of infected individuals to a point where the disease can be considered to be effectively controlled.

REFERENCES

- (1) Putnam, L. E., and Roberts, E. F.: Prolonged blood concentrations of penicillin following intramuscular benzathine penicillin G. *Antibiotics* 4: 931-933, September 1954.
- (2) Smith, C. A., O'Brien, J. F., Simpson, W. G., Harb, F. W., and Shafer, J. K.: Treatment of early infectious syphilis with N,N'-dibenzylethylenediamine penicillin G. *Am. J. Syph., Gonorr. & Ven. Dis.* 38: 136-142, March 1954.
- (3) Stollerman, G. H., and Rusoff, J. H.: Prophylaxis against group A streptococcal infections in rheumatic fever patients. Use of a new repository preparation. *J. A. M. A.* 150: 1571-1575, December 20, 1952.
- (4) Hookings, C. E., and Graves, L. M.: Speed zone epidemiology: A preliminary report on benzathine penicillin G for gonorrhea in women. *Pub. Health Rep.* 71: 1142-1143, November 1956.

Advisory Group on Medical Research and Education

A group of special consultants have been appointed by the Secretary of Health, Education, and Welfare to advise him on the status and future needs of medical research. The consultants will investigate such questions as the impact of the expanding research programs on medical education, the availability of scientists, technicians, and facilities, and the relative emphasis on research in the various disease fields. Other subjects to be studied are the relative emphasis given to fundamental studies in the basic sciences generally, the relationship between Federal and private research programs, and the standards for approval of research projects.

Chairman of the group is Dr. Stanhope Bayne-Jones, former dean of the Yale Medical School, and more recently presi-

dent of the New York Hospital-Cornell Medical Center Joint Administration Board and technical director of research in the Army Medical Research and Development Program. Other members are:

Dr. George Packer Berry, dean, Medical School, Harvard University; Thomas P. Carney, vice president, Eli Lilly & Co.; Dr. Lowell T. Coggeshall, dean, division of biological sciences, University of Chicago.

Fred Carrington Cole, vice president, Tulane University; Samuel Lenher, vice president, E. I. du Pont de Nemours Co.; Dr. Irvine H. Page, director of research, Cleveland Clinic Foundation; Robert C. Swain, vice president in charge of research and development, American Cyanamid Co.

Dr. Stafford L. Warren, dean, School of Medicine, University of California Medical Center; and James Edwin Webb, president and general manager, Republic Supply Co. (former Under Secretary of State and former Director of the Bureau of the Budget).

HISTOPLASMOSIS

CHESTER W. EMMONS, Ph.D.

JUST 51 years ago at Ancon Hospital in the Canal Zone, Dr. Samuel T. Darling, in one of his studies observed and first described histoplasmosis (1). This mycosis, perhaps more than any other, has drawn the attention of the medical world to the importance of fungus infections of man. The discovery was actually a byproduct of a search for another disease. The frequent occurrence of splenomegaly and the known occurrence of cutaneous leishmaniasis in Latin America had suggested to observers that visceral leishmaniasis also might occur in that area. Darling was searching for kala-azar when, on December 7, 1905, examining smears from lungs, spleen, and bone marrow he observed enormous numbers of oval cells 1-4 μ in size, situated free or in alveolar epithelial cells. Influenced no doubt by the objectives of his search, he believed the intracellular organisms were flagellate protozoa and he proposed for them the name, *Histoplasma "capsulata,"* the spelling of which he corrected in a later paper.

Darling's Three Cases

The patient was a Martinique Negro admitted to the hospital only 2 days before with a disease which resembled miliary pulmonary tuberculosis. Two other cases came to Dar-

ling's attention within the space of 2½ years, and in a second paper (2) he repeated almost verbatim his description of the first case and recorded in equally discriminating clinical and pathological detail cases 2 and 3. The second patient, like the first, was a Martinique Negro recently arrived in the isthmus and the third was a Chinese, a native of Canton, who had been in the isthmus for 15 years. Darling found only these 3 cases among 33,000 hospital admissions and concluded that the disease was very infrequent in occurrence. He unsuccessfully sought the etiological agent in surface ground waters and in a wide variety of native animals and insects.

In a third paper published in 1909 (3) he again reported the three cases in detail and described histoplasmosis as a fatal infectious disease characterized by splenomegaly, emaciation, irregular pyrexia, leukopenia, and anemia with invasion of endothelial cells in the smaller lymph and blood vessels by enormous numbers of micro-organisms. He described necrosis of the liver, splenomegaly, pseudogranulomata of the lungs and intestines with ulcerations of the latter, and with necrosis of lymph nodes draining injected viscera. Although his concept of the disease included certain errors of interpretation and, being based upon a study of three fatal cases, did not encompass the full gamut of manifestations and degrees of severity recognized today, he drew a surprisingly accurate picture of fatal histoplasmosis.

Darling was convinced by this time that the disease no longer existed in Panama, and he concluded his third paper in almost the same phraseology used in his second with the prophetic statement, "The mode of infection and the portal of entry are unknown; these together

Dr. Emmons, of the Laboratory of Infectious Diseases, National Institute of Allergy and Infectious Diseases, Public Health Service, Bethesda, Md., gave a talk on which this paper is based before the Second Inter-American Medical Convention, April 3, 1957. The convention was sponsored by the Medical Association of the Isthmian Canal Zone and met at the University of Panama.

with the zoological status of the micro-organism may yet be ascertained by physicians living in less salubrious regions of tropical America than Panama and in those not yet disturbed by the sanitarian."

Twenty Years Later

Histoplasmosis did indeed seem to have disappeared from Panama. It was next reported 20 years later and 3,000 miles away in Minnesota (4), but under what degree of neglect on the part of the sanitarian we are not told. It reappeared also in the tropics in 1926 with the fifth report of a fatal case in a Honduran laborer on a banana plantation (5). Although the next report actually from the isthmus was that of a canine case reported by Tomlinson and Grocott in 1945 (6), it is now apparent that histoplasmosis is of frequent occurrence in Panama and undoubtedly there has been no interruption in its occurrence as a common but inapparent disease in this area. The evidence from skin tests (7, 8) and soil isolations (9) in Panama supports this concept.

Actually, the fourth human case of fatal histoplasmosis to be recognized in Panama was reported by Draheim, Mitchell, and Elton (10) in 1951, 45 years after Darling's original observations. Recent evidence of human benign infection in Panama comes also from Puckett's very important studies of coin lesions (histoplasmoses) and healed granulomas in which, by special staining, he was able to demonstrate *Histoplasma* (11). Nine of the men in his series of 22 had lived 2 years or more in Panama. In an expanded series reported by Forsee, Puckett, and Hagman (12), 13 of 30 patients with such lesions had lived in Panama from 2 to 5 years, and there was acceptable evidence that the lesions developed during residence in Panama in 4 of these men.

The 45-year interval between Darling's and Draheim's cases does not reflect a complete disappearance of *Histoplasma* from Panama during that time. Tomlinson and Grocott's canine case reported in 1945 has already been mentioned. An accidental but very important discovery by Zimmerman of a human case of benign histoplasmosis helps to fill in a segment of the history. Reexamination with special

stains of a solitary pulmonary lesion in a 4-year-old Panamanian child dying in 1931 with another disease revealed *Histoplasma* in the necrotic center of the healed granuloma (13). It may be anticipated that further studies of similar material will yield evidence of additional unrecognized cases of benign histoplasmosis spanning this period when histoplasmosis was overlooked in the country where it was first observed and described.

I am well aware that to this point my historical review of histoplasmosis is familiar, that many severe cases of histoplasmosis have been recognized during the past 2 years in Panama, and that current interest in the mycosis has revealed many as yet unpublished facts about its frequency and importance there.

Status Today

Today histoplasmosis is known in some 22 countries of the world (14, 15), including highly sanitized as well as primitive areas. Histoplasmosis is not exclusively a disease of the tropics or of the United States, where it has been most intensively studied, nor is it a disease of unhygienic geographic areas in the usual connotation of that phrase. Neither is it a protozoan disease, nor a usually fatal disease as Darling supposed, but these are details in the delineation of the mycosis which detract little from the accuracy of its first description and not at all from the genius of the describer.

There have been many steps in the development of our current knowledge of histoplasmosis, but before I review some of these in chronological order, I want to mention another recent significant contribution from Panama. One of the diagnostic problems that benign histoplasmosis has presented is a nonspecific and often minimal host reaction and a paucity of fungus cells in minimal lesions. A histopathological diagnosis, consequently, has often been missed, particularly in old healed lesions where the fungus, presumably, is dead. A number of selective stains have been proposed and used with eminent success, but most of these stain old or dead cells poorly. The most useful stain for the demonstration of *Histoplasma* in old, quiescent and healed lesions is the modification of Gomori's methenamine-silver-nitrate tech-

nique as applied in the laboratories of Gorgas Hospital (formerly Ancon Hospital) and reported by Grocott (16). This modification, as he modestly states, does not supplant such stains as the periodic acid-Schiff and the Gridley stains, but it makes cells of *Histoplasma* and other fungi so conspicuous in the section of an old necrotic or partially calcified lesion that their demonstration no longer presents a serious problem.

Discoveries and developments leading to present concepts of histoplasmosis have been reviewed in many papers. Da Rocha-Lima's opinion (17), accepted by Darling according to Meleny (18), that *Histoplasma* was a fungus was fully verified in 1934 when Tompkins at Vanderbilt University made the first antemortem diagnosis of histoplasmosis by examination of a blood smear (19). DeMonbreun isolated in culture and described in great detail the growth of the fungus under varying environmental conditions (20). Hansmann and Schencken (21) isolated the fungus in the same year, but, because of certain clinical features observed in their patient, they did not immediately reach the diagnosis of histoplasmosis.

Year by year additional cases were reported until in 1945 Parsons and Zerafonetis (22) reviewed 71 cases, in only 4 of which the patient had survived to the time of report.

In the meantime an increasing mass of evidence indicated that, in certain geographic areas at least, a pulmonary disease generally assumed to be healed tuberculosis must have some other etiology (23-25). Smith (26), speaking from his experience with benign pulmonary coccidioidomycosis, suggested this might be a hitherto unrecognized form of histoplasmosis. Christie and Peterson (27, 28) observed an association between histoplasmin sensitivity and the presence of calcified pulmonary lesions in tuberculin negative individuals. Palmer, knowing of these observations, used histoplasmin prepared some time before in the Mycology Unit of the National Institutes of Health (29) in his well-known study of tuberculin and histoplasmin sensitivity in student nurses and found remarkable geographic differences in rates of histoplasmin sensitivity (30-32).

Furcolow and associates (33-35) described

the pulmonary lesions and traced the correlation between their development and the acquisition of skin sensitivity to histoplasmin. The nonspecificity of histoplasmin was known before it was used in any mass testing (29), and histoplasmin and yeast-phase *Histoplasma* antigens as used today have nonspecific components which limit their usefulness as diagnostic agents in both intradermal and serologic tests (36-40). Nevertheless, both uses have resulted in tremendous strides in our knowledge of the frequency of histoplasmosis.

These studies have revealed that histoplasmosis is usually benign, varying in severity from a clinically inapparent respiratory infection manifested only by the acquisition of skin sensitivity to a more severe pulmonary disease with cavitation. Pulmonary calcification is a frequent, but not an invariable, sequela of these mild and moderately severe cases. It is only in the exceptional case that histoplasmosis becomes disseminated and may terminate fatally.

More detailed reviews of the development of our knowledge of histoplasmosis and more extensive bibliographies are given in recent review papers (41-43). These papers review also the clinical variations of histoplasmosis, including manifestations not observed by Darling, such as involvement of the central nervous system, adrenal damage, and endocarditis. It is not my intention to dwell further upon the clinical aspects of histoplasmosis since these have been so fully and repeatedly covered in many case reports and review papers.

Laboratory Confirmation

Any reference to the clinical variability of histoplasmosis suggests the importance of a laboratory diagnosis. Laboratory confirmation of a clinical impression or diagnosis is indeed essential in this mycosis. Within limits, diagnostic antigens are useful in attempts to reach a diagnosis. These limitations are perhaps greater than in most bacterial diseases. Dermal sensitivity to histoplasmin persists for many years, and the rate of histoplasmin sensitivity within an endemic area may be so high that a skin reaction has little diagnostic value unless a recent conversion to sensitivity can be

shown. Correlation of rising complement fixation or precipitin titers with an illness has greater diagnostic value than the skin test, but reactions to both histoplasmin and yeast-phase antigens must be interpreted with caution since it is well recognized that several of the pathogenic fungi have one or more antigens in common. Cross reactions with blastomycosis, coccidioidomycosis, or other mycoses may occur in some patients so that it is necessary in a serodiagnosis to obtain paired or multiple serums and to test these against a battery of fungus antigens. Campbell has very ably investigated the problems of the serologic diagnosis of histoplasmosis and has discussed techniques and the correct interpretation of results (36-38).

A more conclusive diagnostic procedure is the isolation of *Histoplasma* in culture and this should always be attempted. Sputum, blood, bone marrow, at least in infants, skin lesions, ulcer base, and lymph nodes, or pulmonary lesions obtained by surgical excision, should be spread upon agar slants and incubated at 23°-30° C. Many culture media have been used and their relative efficiency compared, but freshly prepared glucose-neopeptone agar (modified Sabouraud's) is convenient and adequate. When contaminated material such as sputum is used for inoculum, the agar should be made unsuitable for bacterial growth by the addition of 0.5 micrograms each of penicillin and streptomycin per milliliter of agar.

The mouse is highly susceptible to histoplasmosis (44, 45) and may be used for diagnosis by the intraperitoneal injection of sputum. Mice require protection against bacteria in the sputum inoculum, and this usually can be achieved by mixing penicillin and streptomycin with the sputum before injection or by subsequent treatment of the mice. More detailed information about diagnostic procedures is available in many papers.

Epidemiological Features

Histoplasmosis shares with the other deep mycoses an apparent inability to spread from person to person. The parasitic or tissue phase of the dimorphic fungus is infectious experimentally, but it is not an effective agent in transmission of the disease, and contagion of

histoplasmosis has not been observed. On the contrary, the patient, according to best evidence available, invariably acquires his infection from an environmental site where *Histoplasma* is growing as a saprophyte.

The infectious particles are the conidia or spores which are produced freely under suitable conditions. They are much more resistant to deleterious influences than the fragile yeast cells of the parasitic growth phase and are inhaled by the patient during the performance of activities which release these spores as airborne dust. This concept rests upon the evidence of many case histories, the demonstration that *Histoplasma* can be grown in the laboratory upon sterilized soil, the isolation of *Histoplasma* in culture from soil in nature, and the actual demonstration of the distinctive macroconidia of *Histoplasma* in soil naturally colonized by the fungus (46, 47).

Since all available evidence had suggested the importance of an environmental source of infection, the Mycology Laboratory of the National Institutes of Health began a systematic search for saprophytic sources of *Histoplasma* in 1946.

Histoplasma was first isolated from soil and reported in 1949 after some 350 specimens had been unsuccessfully examined. Macroconidia were observed in the first positive specimens (46). The first positive specimens were two samples of red clay taken from a mound of earth at the entrance to a rat burrow located under the edge of a chickenhouse where infected rats had previously been trapped.

This discovery was made while we were somewhat preoccupied with the possible importance of an animal reservoir and the fact that this, as well as many subsequent isolations of *Histoplasma* were from chickenhouses on farm premises where rats with histoplasmosis had been trapped, obscured at first the more important of the two associations. Zeidberg and co-workers (48) were first to point out the association between the saprophytic growth of *Histoplasma* in soil and the presence of chickens. Since this predilection of *Histoplasma* for enriched soil in or near chickenhouses has been recognized, it is now almost routine, within an endemic area, to isolate *Histoplasma* from such sites and often from a high percentage of sam-

ples. Many cases of histoplasmosis in man have been related to exposure to dust, incident to the cleaning of old or neglected chickenhouses. However, such an exposure has not been recognized in many other cases, and *Histoplasma* has been isolated from environments with no apparent relationship to chickens.

It should be recognized further that the frequent occurrence of *Histoplasma* in, under, or near chickenhouses is not dependent upon a host-parasite relationship to the chicken. No naturally infected chickens have been observed, and histoplasmosis cannot be produced experimentally in the chicken although the fungus can be isolated from tissues for a short time after intravenous inoculation. On the contrary this appears to be an entirely saprophytic relationship to enriched soil contaminated by chicken droppings and to other similarly suitable soils with high organic content.

Whether the apparent immunity of the chicken to histoplasmosis is simply a matter of the bird's high body temperature remains to be proved. Mammals, on the other hand, show a wide range of species susceptibility. DeMonbreun (49) observed histoplasmosis in the dog, and this animal still represents the only economically important host of histoplasmosis recognized in veterinary medicine (50). However, other animals are susceptible. We have isolated *Histoplasma* in culture from 9 other species: the cat, brown rat, roof rat, mouse, fox, opossum, striped skunk, spotted skunk, and marmot (51). Others have found the fungus in the horse and cow (52, 53). The histoplasmin skin test has been used widely in veterinary medicine (54).

Histoplasmosis, as observed in these animals, has been for the most part a very mild and probably a self-limited disease. We have observed the progressive and fatal form only in the dog although isolation of the fungus from spleen and liver provided evidence of dissemination in many of the cats, rats, skunks, and other animals examined. Our evidence does not show conclusively whether histoplasmosis is a frequent cause of death in wild animals. In the case of dogs and cats, we have conclusive evidence that histoplasmosis usually is benign and that it is an infrequent cause of death.

Because of a rabies control program conducted in a rural county in northern Virginia, we were able to get directly from their owners several hundred healthy dogs and cats. Using the most productive method of examination we could devise, the intraperitoneal injection of mice with homogenized hilar and mediastinal lymph nodes, we isolated *Histoplasma* by mouse passage from 50 percent of a series of cats and dogs (55, 56).

Since, in a study extending over a period of several years, we have found relatively few dogs with fatal histoplasmosis, we are forced to the conclusion that most of these healthy animals would have survived their primary infection, in most cases without clinical evidence of disease. We were not able to find a correlation between naturally acquired mild histoplasmosis in the dog, as proved by isolation of *Histoplasma* from lymph nodes, and either dermal or serologic evidence of infection (56). This lack of correlation could have been due to inadequacy of the antigens, to the mild and apparently self-limited nature of the disease, or to the varying and unknown duration of the disease in these naturally infected animals. It should be emphasized that, although histoplasmosis occurred in half of the dogs and cats in this particular endemic area, there is no evidence to support the concept that these animals are responsible for the endemicity of the mycosis. On the contrary, as pointed out above, the fungus, *Histoplasma capsulatum* is a part of the saprophytic soil microflora, and it is undoubtedly from this environmental source that both man and animals are infected.

Antibiotic Therapy

There is as yet little to report on the chemotherapy of histoplasmosis. Ascospores and mycelium (57, 58) can be shown to protect experimentally infected mice against histoplasmosis, but toxicity or inability to attain effective blood levels, or both, have limited the clinical usefulness of these antibiotics. A new antibiotic which shows considerable promise is Amphotericin B (59). In experimentally infected mice, Amphotericin B will not only protect mice from death but will clear the tissues of fungi as indicated by negative cultures when

the experiment is terminated. Clinical experience with this antibiotic is still limited.

The number of publications on histoplasmosis now appearing annually is many times greater than all the medical literature on all the deep mycoses published during the 3 years while Darling was searching for what he believed to be a new type of leishmaniasis. Many of the questions concerning the etiology and epidemiology of histoplasmosis left unanswered by Darling have now been answered, but we still seek information about its geographic endemicity, its clinical variability, and, especially, its safe and effective treatment. It is appropriate that during recent years attention has again turned to the part of tropical America which, in a sense, was the cradle of histoplasmosis. The concerted attack upon histoplasmosis now anticipated here will surely be productive.

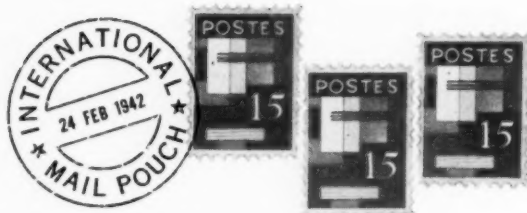
REFERENCES

- (1) Darling, S. T.: A protozoan general infection producing pseudotubercles in the lungs and focal necroses in the liver, spleen and lymph nodes. *J. A. M. A.* 46: 1283-1285 (1906).
- (2) Darling, S. T.: Histoplasmosis: A fatal infectious disease resembling kala-azar found among natives of tropical America. *Arch. Int. Med.* 2: 107-123 (1908).
- (3) Darling, S. T.: The morphology of the parasite, *H. capsulatum*, and the lesions of histoplasmosis, a fatal disease of tropical America. *J. Exper. Med.* 11: 515-531 (1909).
- (4) Watson, C. V., and Riley, W. A.: A case of Darling's histoplasmosis originating in Minnesota. *Arch. Path.* 1: 662-667 (1926).
- (5) Phelps, B. M., and Mallory, F. B.: Toxic cirrhosis and primary liver cell carcinoma complicated by histoplasmosis of the lung. In *Fifteenth Annual Report, Medical Department, United Fruit Company*. New York, 1926, pp. 115-123.
- (6) Tomlinson, W. J., and Grocott, R. G.: Canine histoplasmosis. A pathologic study of the three reported cases and the first case found in the Canal Zone. *Am. J. Clin. Path.* 15: 501-507 (1945).
- (7) Tucker, H. A.: Histoplasmin sensitivity in the Panama Canal Zone. *A. M. A. Arch. Dermat. & Syph.* 64: 713-720 (1951).
- (8) Tucker, H. A.: Histoplasmosis in the Isthmus of Panama; Summary of epidemiologic survey and report of fourth local case. *Am. J. Trop. Med. & Hyg.* 1: 462-469 (1952).
- (9) Ajello, L.: Occurrence of *Histoplasma capsulatum* and other human pathogenic molds in Panamanian soil. *Am. J. Trop. Med. & Hyg.* 3: 897-904 (1954).
- (10) Draheim, J. H., Mitchell, J. R., and Elton, N. W.: Histoplasmosis: Fourth case report from Canal Zone. *Am. J. Trop. Med.* 31: 753-760 (1951).
- (11) Puckett, T. F.: Pulmonary histoplasmosis; A study of 22 cases with identification of *H. capsulatum* in resected lesions. *Am. Rev. Tuberc.* 67: 453-476 (1953).
- (12) Forsee, J. H., Puckett, T. F., and Hagman, F. E.: Surgical considerations in focalized pulmonary histoplasmosis. *J. Thoracic Surg.* 26: 131-139 (1953).
- (13) Zimmermann, L. E.: A missing link in the history of histoplasmosis in Panama. *U. S. Armed Forces M. J.* 5: 1569-1573 (1954).
- (14) Edwards, P. Q., and Kiaer, J. H.: World-wide geographic distribution of histoplasmosis and histoplasmin sensitivity. *Am. J. Trop. Med. and Hyg.* 5: 235-257 (1956).
- (15) Mochi, A., and Edwards, P. Q.: Geographical distribution of histoplasmosis and histoplasmin sensitivity. *Bull. World Health Org.* 5: 259-291 (1952).
- (16) Grocott, R. G.: A stain for fungi in tissue sections and smears using Gomori's methenamine-silver nitrate technic. *Am. J. Clin. Path.* 25: 975-979 (1955).
- (17) Da Rocha-Lima, H.: Beitrag zur Kenntnis der Blastomykosen; Lymphangitis epizootica und Histoplasmosis. *Centralb. f. Bakt., Abt. 1*, 67: 233-249 (1912).
- (18) Meleney, H. E.: The histopathology of kala-azar in the hamster, monkey, and man. *Am. J. Path.* 1: 147-168 (1925).
- (19) Dodd, K., and Tompkins, E. H.: A case of histoplasmosis of Darling in an infant. *Am. J. Trop. Med.* 14: 127-137 (1934).
- (20) DeMonbreun, W. A.: The cultivation and cultural characteristics of Darling's *Histoplasma capsulatum*. *Am. J. Trop. Med.* 14: 93-125 (1934).
- (21) Hansmann, G. H., and Schencken, J. R.: A unique infection in man caused by a new yeast-like organism, a pathogenic member of the genus *Sepedonium*. *Am. J. Path.* 10: 731-738 (1934).
- (22) Parsons, R. J., and Zarafonitis, C. J. D.: Histoplasmosis in man; Report of seven cases and a review of seventy-one cases. *Arch. Int. Med.* 75: 1-23 (1945).
- (23) Gass, R. S., and others: Tuberculosis studies in Tennessee; Roentgenological evidence of tuberculosis infection in relation to tuberculin sensitivity in school children. *Am. Rev. Tuberc.* 38: 441-447 (1938).
- (24) Lumsden, L. L., Dearing, W. P., and Brown, R. A.: Questionable value of skin testing as a

- means of establishing an epidemiological index of tuberculous infection. *Am. J. Pub. Health* 29: 25-34 (1939).
- (25) Olson, B. J., Wright, W. H., and Nolan, M. O.: An epidemiological study of calcified pulmonary lesions in an Ohio county. *Pub. Health Rep.* 56: 2105-2126, Oct. 31, 1941.
 - (26) Smith, C. E.: Coccidioidomycosis. *M. Clin. North America* 27: 790-807 (1943).
 - (27) Christie, A., and Peterson, J. C.: Pulmonary calcification in negative reactors to tuberculin. *Am. J. Pub. Health* 35: 1131-1147 (1945).
 - (28) Christie, A., and Peterson, J. C.: Pulmonary calcification and sensitivity to histoplasmin, tuberculin, and haplosporangin. *J. A. M. A.* 131: 658-660 (1946).
 - (29) Emmons, C. W., Olson, B. J., and Eldridge, W. W.: Studies of the role of fungi in pulmonary disease. I. Cross-reactions of histoplasmin. *Pub. Health Rep.* 60: 1383-1394, Nov. 23, 1945.
 - (30) Edwards, L. B., Lewis, I., and Palmer, C. E.: Studies of pulmonary findings and antigen sensitivity among student nurses. III. Pulmonary infiltrates and mediastinal adenopathy observed among student nurses at the beginning of training. *Pub. Health Rep.* 63: 1569-1600, Dec. 3, 1948.
 - (31) Palmer, C. E.: Nontuberculous pulmonary calcification and sensitivity to histoplasmin. *Pub. Health Rep.* 60: 513-520, May 11, 1945.
 - (32) Palmer, C. E.: Geographic differences in sensitivity to histoplasmin among student nurses. *Pub. Health Rep.* 61: 475-487, Apr. 5, 1946.
 - (33) Bunnell, I. L., and Furcolow, M. L.: A report on ten proved cases of histoplasmosis. *Pub. Health Rep.* 63: 299-316, Mar. 5, 1948.
 - (34) Furcolow, M. L., Mantz, H. L., and Lewis, I.: The roentgenographic appearance of persistent pulmonary infiltrates associated with sensitivity to histoplasmin. *Pub. Health Rep.* 62: 1711-1718, Dec. 5, 1947.
 - (35) Furcolow, M. L.: Further observations on histoplasmosis. *Mycology and bacteriology.* *Pub. Health Rep.* 65: 965-994, Aug. 4, 1950.
 - (36) Campbell, C. C.: Cross reactions of mycotic antigens. In *Proceedings of the Conference on Histoplasmosis, 1952.* PHS Pub. No. 465. *Pub. Health Monogr.* No. 39. Washington, D. C., U. S. Government Printing Office, 1956, pp. 144-148.
 - (37) Campbell, C. C., and Binkley, G. E.: Serologic diagnosis with respect to histoplasmosis, coccidioidomycosis and blastomycosis and the problem of cross reactions. *J. Lab. & Clin. Med.* 42: 896-906 (1953).
 - (38) Hill, G. B., and Campbell, C. C.: A further evaluation of histoplasmin and yeast phase antigen of *Histoplasma capsulatum* in the complement fixation test. *J. Lab. & Clin. Med.* 48: 255-263 (1956).
 - (39) Howell, A.: Studies of fungus antigens; Quantitative studies of cross-reactions between histoplasmin and blastomycin in guinea pigs. *Pub. Health Rep.* 62: 631-651, May 2, 1947.
 - (40) Salvin, S. B.: The serologic relationship of fungus antigens. *J. Lab. & Clin. Med.* 34: 1096-1104 (1949).
 - (41) Emmons, C. W.: Histoplasmosis. *Bull. New York Acad. Med.* 31: 627-638 (1955).
 - (42) Loosli, C. G.: Histoplasmosis. *M. Clin. North America* 39: 171-199 (1955).
 - (43) Silverman, F. N., Schwarz, J., and Labey, M. E.: Histoplasmosis. *Am. J. Med.* 19: 410-459 (1955).
 - (44) Ajello, L., and Runyon, L. C.: Infection of mice with single spores of *Histoplasma capsulatum*. *J. Bact.* 66: 34-40 (1953).
 - (45) Rowley, D. A., and Huber, M.: Pathogenesis of experimental histoplasmosis in mice; Measurement of infecting dosages of the yeast phase of *Histoplasma capsulatum*. *J. Infect. Dis.* 96: 174-183 (1955).
 - (46) Emmons, C. W.: Isolation of *Histoplasma capsulatum* from soil. *Pub. Health Rep.* 64: 892-896, July 15, 1949.
 - (47) Emmons, C. W.: Significance of saprophytism in the epidemiology of the mycoses. *Tr. New York Acad. Sc., Ser. II.* 17: 157-166 (1954).
 - (48) Zeidberg, L. D., Ajello, L., Dillon, A., and Runyon, L. C.: Isolation of *Histoplasma capsulatum* from soil. *Am. J. Pub. Health* 42: 930-935 (1952).
 - (49) DeMonbreun, W. A.: The dog as a natural host for *H. capsulatum*. *Am. J. Trop. Med.* 19: 565-587 (1939).
 - (50) Cole, C. R., Farrell, R. L., Chamberlain, D. M., Prior, J. A., and Saslaw, S.: Animal histoplasmosis. In *Proceedings of the Conference on Histoplasmosis, 1952.* PHS Pub. No. 465. *Pub. Health Monogr.* No. 39. Washington, D. C., U. S. Government Printing Office, 1956, pp. 274-276.
 - (51) Emmons, C. W., Rowley, D. A., Olson, B. J., Mattern, C. F., Bell, J. A., Powell, E., and Marcey, E. A.: Histoplasmosis, proved occurrence of inapparent infection in dogs, cats and other animals. *Am. J. Hyg.* 61: 40-44, January 1955.
 - (52) Menges, R., and Kintner, L. D.: Bovine histoplasmosis. *North Am. Vet.* 32: 692-695 (1951).
 - (53) Richman, H.: Histoplasmosis in a colt. *North Am. Vet.* 29: 710 (1948).
 - (54) Menges, R. W.: The histoplasmin skin test in animals. *J. Am. Vet. M. A.* 119: 69-71 (1951).
 - (55) Emmons, C. W., and Rowley, D. A.: Isolation of *Histoplasma capsulatum* from fresh and deep-frozen peribronchial lymph nodes of naturally infected dogs by mouse inoculation. *J. Lab. & Clin. Med.* 45: 303-307 (1955).
 - (56) Rowley, D. A., Haberman, R. T., and Emmons,

- C. W.: Histoplasmosis: Pathologic studies of fifty cats and fifty dogs from Loudoun County, Virginia. *J. Infect. Dis.* 95:98-108 (1954).
- (57) Campbell, C. C., Hodges, E. P., and Hill, G. B.: Therapeutic effect of Nystatin (Mycostatin) in mice experimentally infected with *Histoplasma capsulatum*. *Antibiotics* 4:406-410 (1954).

- (58) Emmons, C. W.: Ascospores in the treatment of experimental histoplasmosis in mice. *Antibiotics* 3:1204-1210 (1953).
- (59) Louria, D. B., Feder, N., and Emmons, C. W.: Amphotericin B in experimental histoplasmosis and cryptococcosis. *Antibiotics Annual 1956-1957*. New York, N. Y., New York Medical Encyclopedia, Inc., 1957, pp. 870-877.



Passing of a Practice

When three Chinese experts, a WHO adviser, and a sanitary engineer arrived in Japan from Taiwan for a 2-week tour of inspection, they found that more than a hundred cities were building sewer or sewage treatment systems. The team took for granted that this building was spurred by a desire to make night soil fertilization safe for public health. But they discovered that the Japanese Government had no program encouraging the use of night soil, although 2 systems for night soil treatment and 1 garbage composting plant are under construction. The death knell of this controversial, age-old practice was sounded by the progress of industrialization and education of farmers, by broadened access to chemical fertilizers, and by the modern policies of the Ministry of Health and Welfare, which were accepted by the Ministry of Agriculture.

—JOEL I. CONNELLY and A. DALE SWISHER, engineers, *United States Operations Mission, Taiwan*.

Anthrax Factories

Although Iran is not a highly industrialized country, industrial labor forms a noteworthy proportion of the population. Except for a few organizations such as the National Oil Company, management pays little heed to health requirements of the workers.

Recent reports on the prevalence of anthrax in some of the wool and hide factories caused us to have

health conditions inspected. The health department physician assigned to the task reported that plant managers do not consider health matters of importance. The factory environment generally is insanitary. Some factories are without windows; the air is often foul and in most full of dust. Satisfactory lavatories are lacking in many plants.

—GLEN W. McDONALD, M.D., M.P.H., chief, *Public Health Division, United States Operations Mission, Iran*.

A Day to Remember

Not one villager in a hundred in Alamata, Ethiopia, had seen a movie before we scheduled a film show on malaria, in advance of operations to be carried out in the Kobo-Chercher plain, north of Addis Ababa. For electrical power for the movie, we carried a generator in our big truck, locally dubbed the "kudu wagon."

An hour before dark, the villagers began to gather around the projectors set up in the market place. The governor and head men, including invited guests from neighboring villages, arrived at dark and were ushered to the few available chairs.

As the first film strips were shown, the audience of 500 swelled to 800. They were all eyes and ears! Next on the program was a malaria movie, explained by an Ethiopian official speaking Amharic. Last, a film showed the Emperor on his 1954 visit to the United States. The response, Ethiopian team members assured us, meant that the villagers now had a new understanding of malaria and of what the strangers from America, working with their fellow countrymen, were trying to do.

—PAUL L. RICE, entomologist, *United States Operations Mission, Ethiopia*

California finds that when household survey data are adjusted to include information on patients who have died, hospital admissions are increased by 6 percent and hospital days by 10 percent.

Household Surveys for Hospital Planning: Adjustment for Decedents Missed

BETH M. SIEGEL, B.A., NEDRA B. BELLOC, M.A., and FRANK E. HESSE, M.D., M.P.H.

BECAUSE household surveys can be designed to describe general population groups within a specified range of sampling variation, they are being used increasingly to gather data on illness and medical care, including services provided by hospitals. Household survey data, however, are subject to a number of limitations. Important among these from the standpoint of data for use in planning hospital facilities is the usual exclusion of persons who have died during the period covered by the survey. If this period is the customary 1 year, rates of hospital use may be affected substantially by the omission of data for this group.

Information about persons who have died is seldom obtained in household surveys because it is difficult, if not impossible, to obtain a complete and unduplicated count of decedents. Many persons with terminal illness are elderly and live in one-person households. Such house-

holds are dissolved with the death of their solitary members, leaving no one of whom questions can be asked. Also, a household may be dissolved at the death of a parent or spouse, with several survivors moving to new households and constituting potential respondents.

Two recent surveys conducted by the California State Department of Public Health under research grants from the National Institutes of Health, Public Health Service, permit examination of the question of exclusion of decedents. The first was an exploratory study of methods conducted in San Jose in 1952 (1). By means of a check with hospital records, this survey demonstrated the validity of household interview reports of hospitalization (2). It also provided data on the actual hospital experience of residents of the city who died during the 1-year period covered by the survey. The second survey, conducted between May 1954 and April 1955, was a statewide effort to measure illness and use of medical services through interviews of about 10,000 households. It covered hospitalization during the previous 1-year period for the population living at the time of the interview.

In this paper, the San Jose data are compared with an estimate of hospital care for decedents used in a nationwide survey of persons aged 65 and over reported by Falk and Brew-

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Arthur Weissman, who directed the San Jose survey, assisted in preparing material for this paper.

Table 1. Number of admissions and days in local general hospitals for resident decedents,¹ by place of death, according to age and sex, San Jose, Calif., July 1, 1951–June 30, 1952

Age and sex	Total						Place of death								
	Deaths	Admissions	Days	Average days per admission	Admissions per death	Days per death	General or special hospital			Other institution ²			Not in institution		
							Deaths	Admissions ³	Days ³	Deaths	Admissions ³	Days ³	Deaths	Admissions ³	Days ³
All ages.....	4984	623	9,833	15.8	0.63	10.0	463	527	8,480	124	31	695	4397	65	658
Male.....	532	313	4,119	13.2	.59	7.7	251	269	3,567	51	11	174	230	33	378
Female.....	451	310	5,714	18.4	.69	12.7	212	258	4,913	73	20	521	166	32	280
0–14 years.....	69	24	461	19.2	.35	6.7	53	23	453	3	1	8	13	0	0
Male.....	40	11	139	12.6	.28	3.5	29	10	131	3	1	8	8	0	0
Female.....	29	13	322	24.8	.45	11.1	24	13	322	0	0	0	5	0	0
15–64 years.....	328	241	3,535	14.7	.73	10.8	162	217	3,241	24	1	36	142	23	258
Male.....	204	127	1,457	11.5	.62	7.1	91	112	1,311	14	0	0	99	15	146
Female.....	124	114	2,078	18.2	.92	16.8	71	105	1,930	10	1	36	43	8	112
65 years and over.....	586	358	5,837	16.3	.61	10.0	248	287	4,786	97	29	651	241	42	400
Male.....	287	175	2,523	14.4	.61	8.8	130	147	2,125	34	10	166	123	18	232
Female.....	299	183	3,314	18.1	.61	11.1	118	140	2,661	63	19	485	118	24	168

¹ All deaths, including those of the newborn, of persons whose residence was given as San Jose on the death certificate.

² Mental hospital, tuberculosis hospital, nursing home, correctional or other institution.

³ A death may have occurred in a hospital or elsewhere in or outside San Jose, but hospital admissions and days include only those in the 4 general hospitals

in or immediately adjacent to the city of San Jose (San Jose Community Hospital, O'Connor Hospital, Doctors Hospital, Santa Clara County Hospital).

⁴ Includes 1 death of unknown age.

NOTE: Admissions and days include 1-day stays not overnight and exclude hospitalization of the newborn.

SOURCE: San Jose survey, bureau of chronic diseases, California State Department of Public Health.

ster (3). Also, these data are used to adjust the data obtained in the California health survey.

San Jose Survey

In addition to a household survey and an investigation of other sources of information, the San Jose study included examination of (a) the hospital medical records of all the city's residents who received care in any of the four local general hospitals between July 1, 1951, and June 30, 1952, and (b) the death certificates for all city residents who died in the same period. There were 10,014 hospital records and 984 deaths. The hospital records were abstracted and matched with the death certificates. In this manner the actual hospital experience of decedents was obtained.

Only hospitalization during the year covered

in the survey was included in the data for decedents. A person who died in the hospital on July 2, 1951, for example, was counted as having 1 period of hospitalization lasting 1 day.

The San Jose findings are subject to the major limitation of not including any hospital care that may have been received in other communities. This characteristic undoubtedly results in an understatement of hospitalization, particularly for males aged 15–64, who probably used Veterans Administration hospitals and an industrial hospital outside San Jose.

The San Jose data are derived from hospital records and include 1-day stays not overnight. Such stays are specifically excluded from the California health survey. In the San Jose survey, 1-day stays not overnight amounted to 43 percent of all 1-day stays and 7 percent of all admissions. They represented less than 1 per-

cent of the total hospital days. Counts by age, sex, or other characteristics are not available.

Hospitalization data for the 984 persons in San Jose who died during the period covered by the survey are given in table 1. These persons had 623 hospital admissions, one-fourth of which were nonterminal, and they used 9,833 hospital days.

Comparison With Falk-Brewster Method

In their report on hospitalization for persons aged 65 and over, Falk and Brewster drew attention to the problem of omission of decedents. They estimated the amount of care used by this group and found that its addition to household survey findings increased rates of utilization by approximately one-fourth (fig. 1).

Falk and Brewster estimated hospital experience for decedents by applying assumed hospital admission rates to counts of persons dying. For those dying in hospitals, they figured that each death equaled one admission. For those dying in other institutions, they assumed that there were no admissions, reasoning that these persons make negligible use of hospitals. For persons dying outside institutions, they divided the number in half (since persons dying in 1 year have lived on the average for one-half a year) and applied the admission rates of the household survey population. They determined the number of hospital days by multiplying the estimated number of admissions for each group of decedents by the average length of stay for the household survey population.

The one-fourth increase in rates obtained by this method indicates that, at least in the age group 65 and over, omission of decedents creates a large underestimate. A comparison between

Table 2. Comparison of estimated and actual hospital experience for decedents aged 65 years and over, San Jose, Calif., July 1, 1951-June 30, 1952

Place of death	Number of deaths	Estimated hospital experience (Falk-Brewster method applied to San Jose data)		Actual local general hospital experience (hospital record data)	
		Admissions	Days ¹	Admissions	Days
All places-----	586	258	4, 876	² 333	² 5, 812
General or special hospital-----	248	248	4, 687	² 262	² 4, 761
Other institution--	97	0	0	29	651
Not in institution--	241	³ 10	189	42	400

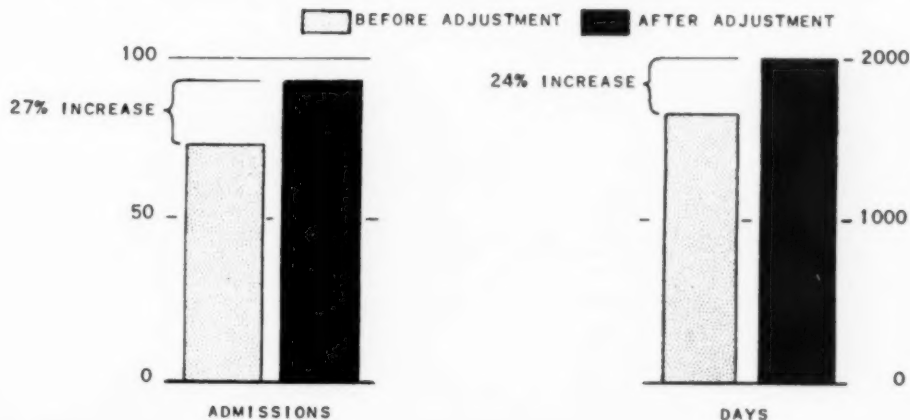
¹ Estimated admissions multiplied by 18.9 days, the average length of stay for persons aged 65 years and over found in household interview part of San Jose survey.

² Excludes an estimated 25 admissions and 25 days for 1-day stays not overnight, derived by applying San Jose finding of 7 percent to actual total of 358 admissions.

³ Based on admission rates for persons aged 65 years and over found in household interview part of San Jose survey: Males, 8.9 percent; females, 7.6 percent.

SOURCE: San Jose survey, bureau of chronic diseases, California State Department of Public Health.

Figure 1. Falk-Brewster adjustment of annual hospital utilization rates, 1952: admissions and days per 1,000 persons, aged 65 years and over.



the actual hospital experience for 586 San Jose decedents aged 65 and over and an estimated experience calculated according to the method of Falk and Brewster indicates that the discrepancy caused by the omission of decedents is even larger (table 2). The Falk-Brewster method gave an estimate of 258 admissions and 4,876 days, whereas there were actually (subtracting an estimated twenty-five 1-day stays not overnight) 333 admissions and 5,812 days. The difference results partly from the failure to allow for multiple admissions of persons who died in general hospitals, partly from the fact that no allowance was made for prior admissions to general hospitals for persons who died in other institutions, and partly from the underestimation of admissions for those who died outside institutions.

Adjustment of Statewide Data

To estimate the total annual use of general hospitals in California, the San Jose data were

used to adjust the findings of the California health survey. Although a respondent in the California health survey might have died on the day following the interview, only his experience as a survivor of the past 12 months was included in the household survey rates. During any one year hospitals also provided care to persons who failed to survive the 12 months. These persons had lived, on the average, for 6 months. Their hospital experience during the part of the year they lived was missed in the California health survey.

The age-sex-specific ratios (admissions and days per death) found for the San Jose decedents were applied to the deaths in each age-sex group reported for the State in 1954 to obtain estimated rates of admissions and days (table 3). These rates were then applied to the data obtained in the California health survey to obtain adjusted rates of admissions and days (table 4).

For all ages, the adjustment of the California health survey data increased the estimate of hospital admissions by 6 percent and hospital

Table 3. Estimated number of admissions and days in non-Federal general hospitals for decedents in California, according to age and sex, 1954

Age and sex	California deaths, 1954 ¹	Ratios found in San Jose		Estimated number		Estimated rate per 1,000 persons ²	
		Admissions per death	Days per death	Admissions	Days	Admissions	Days
All ages	³ 109,402			68,800	1,072,100	6	88
Male	³ 63,662			37,300	486,900	6	82
Female	³ 45,740			31,500	585,200	5	93
0-14 years	9,307			3,300	62,400	1	18
Male	5,386	0.28	3.5	1,500	18,900	1	10
Female	3,921	.45	11.1	1,800	43,500	1	25
15-44 years	10,054			7,300	106,500	1	21
Male	6,437	.62	7.1	4,000	45,700	2	19
Female	3,617	.92	16.8	3,300	60,800	1	22
45-64 years	29,688			21,400	307,700	8	121
Male	19,695	.62	7.1	12,200	139,800	10	112
Female	9,993	.92	16.8	9,200	167,900	7	129
65 years and over	60,306			36,800	595,500	37	593
Male	32,105	.61	8.8	19,600	282,500	41	591
Female	28,201	.61	11.1	17,200	313,000	33	594

¹ By place of residence.

² Adjustment factor; based on population estimates of the California health survey.

³ Includes 39 male and 8 female deaths of unknown age.

SOURCES: San Jose survey, bureau of chronic diseases, and death records, California State Department of Public Health.

Table 4. Number of admissions and days per 1,000 persons per year and average length of stay in general hospitals, according to age and sex: California health survey data unadjusted and adjusted to include experience of decedents ¹

Age and sex	Admissions			Days			Days per admission			For 95 percent confidence level plus or minus the following percent of the unadjusted rate ²	
	Rate per 1,000 persons		Percent increase	Rate per 1,000 persons		Percent increase					
	Unad-justed	Ad-justed		Unad-justed	Ad-justed		Unad-justed	Ad-justed	Percent change	Admis-sions	Days
All ages	93	99	6	881	969	10	9. 5	9. 8	+3	5	12
Male	70	76	9	968	1, 050	8	13. 8	13. 8	0	8	18
Female	114	119	4	798	892	12	7. 0	7. 5	+7	8	18
0-14 years	41	42	2	229	247	8	5. 6	5. 9	+5	17	27
Male	46	47	2	286	296	3	6. 2	6. 3	+2	21	39
Female	35	36	3	169	194	15	4. 8	5. 4	+12	21	35
15-44 years	123	124	1	1, 000	1, 021	2	8. 1	8. 2	+1	8	25
Male	63	65	3	1, 027	1, 046	2	16. 3	16. 1	-1	15	34
Female	176	177	1	976	997	2	5. 5	5. 6	+2	10	22
45-64 years	98	106	8	1, 151	1, 272	10	11. 7	12. 0	+3	8	16
Male	101	111	10	1, 451	1, 563	8	14. 4	14. 1	-2	16	28
Female	94	101	7	862	991	15	9. 2	9. 8	+7	16	23
65 years and over	109	146	34	1, 900	2, 493	31	17. 4	17. 1	-2	15	33
Male	121	162	34	2, 018	2, 609	29	16. 7	16. 1	-4	24	48
Female	98	131	34	1, 792	2, 386	33	18. 3	18. 2	-1	24	47

¹ California health survey covered hospitalization in both Federal and non-Federal hospitals for the non-institutional population living off military posts. The interview period was May 1954-April 1955 covering hospitalization in prior 12-month periods. Hospitalization of newborn is excluded. The adjusted rates underestimate male utilization more than female utilization because this was true of the San Jose ratios used in the adjustment.

² Twice the estimated coefficient of variation. The chances are 95 out of 100 that the percentage difference between the sample survey findings and the results of a complete census of the population would be within twice the coefficient of variation.

SOURCE: California health survey, bureau of chronic diseases, California State Department of Public Health.

days by 10 percent. For persons aged 65 and over, who are the majority of the decedents, the adjustment increased the rates of both admissions and days by about one-third (fig. 2).

Unlike rates of admissions and days, average length of stay is not necessarily increased by adjustment for persons who have died. This adjustment of the California health survey data decreases average stay for the age group 65 and over and increases average stay for all other age groups. The changes are all relatively small. Whether the data reflect real changes cannot be determined because the differences are smaller than sampling fluctuations at the 95-percent confidence level.

In connection with planning medical facilities under the Hospital Survey and Construc-

tion Act (Hill-Burton program), there is considerable interest in bed-population ratios for non-Federal hospitals. These ratios as derived from the California health survey, both unadjusted and adjusted to include experience of decedents, are shown in table 5. The adjustment increases the bed-population ratio from 2.8 to 3.1 beds per 1,000 population of all ages and from 6.9 to 9.2 for the age group 65 and over. From reports submitted to the California State Department of Public Health by hospitals and on information from its field staff, an average of approximately 3 general hospital beds for acutely ill patients per 1,000 population is known to be in actual use in California. In 1956 the State adopted this ratio as the minimum for planning under the Hospital Survey and Construction Act (4).

Note on Institutional Population

Both the study reported by Falk and Brewster and the California health survey were concerned primarily with the noninstitutional population. However, the institutional population uses general hospital care (table 2) and cannot be ignored in estimating total annual admissions and days.

Since the San Jose ratios include use of general hospitals by the institutional population that dies, the adjustment of the California health survey makes allowance for this group. The adjustment, however, does not make allowance for the institutional population that survives. The California health survey included a small sample of the surviving institutional population, but at the time this paper was written this sample had not been tabulated and analyzed.

Validity of the Adjustment

It is recognized that the San Jose ratios represent the experience of only one community. Their application to the United States is questionable. For persons aged 65 and over, Falk and Brewster reported that 31 percent die in general and special hospitals in the United States, whereas the figure for San Jose residents in this age group is 42 percent. The San

Jose ratios, however, are considered applicable to the California health survey data for the following reasons:

1. The San Jose information is the only information known to us on the actual hospital experience of decedents which includes non-terminal care and is also related to a general population.

2. Although no one city can be considered typical of the State, San Jose corresponds to the State in a number of respects. The age and sex composition is similar (table 6). The 1950 census showed no important differences between the population of San Jose and the total population of the State except that the city had a higher proportion of persons with Spanish surnames and a smaller proportion of Negroes.

3. San Jose in 1951-52 and California in 1955 had similar proportions of deaths occurring in hospitals and institutions. For all ages and for persons aged 65 and over, the figure was approximately 60 percent. (California data by age are not available for earlier years, nor do California data separate deaths in general hospitals from deaths in other institutions.)

4. Knowledge of local hospital practices and the little existing comparable data indicate that the type of hospital care available in San Jose in 1951-52 was similar to what might be ex-

Figure 2. Adjustment of annual hospital utilization rates obtained from the California health survey, 1953-55: admissions and days per 1,000 persons, all ages and 65 years and over.

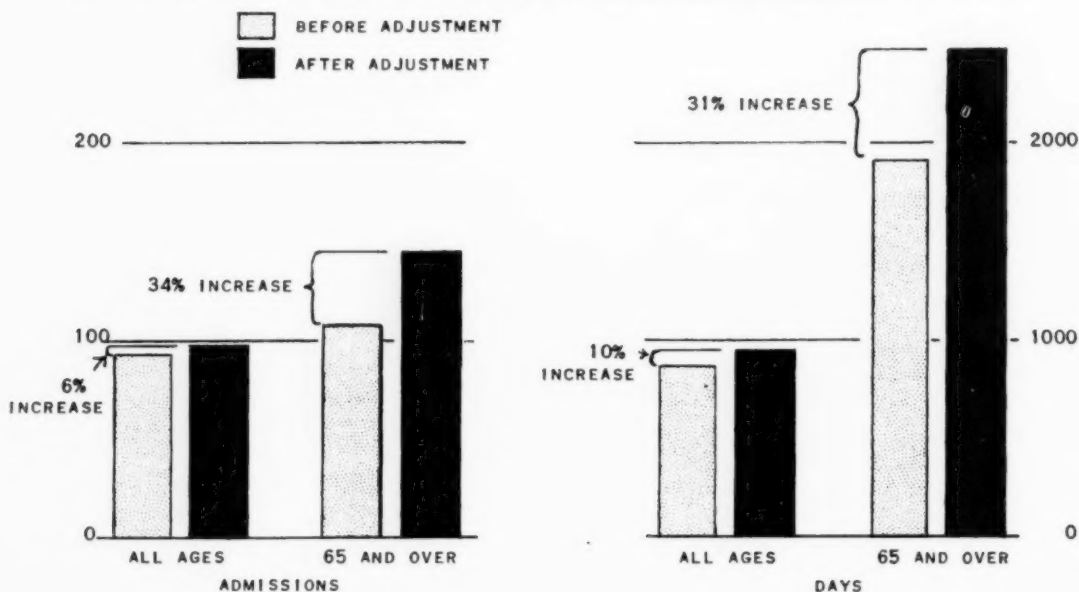


Table 5. Non-Federal general hospital beds used per 1,000 population per year, according to age and sex: California health survey data unadjusted and adjusted to include experience of decedents¹

Age and sex	Beds per 1,000 persons at 70 percent occupancy ²		
	Unadjusted	Adjusted	Percent increase ³
All ages.....	2.8	3.1	12
Male.....	2.7	3.0	12
Female.....	2.9	3.3	12
0-14 years.....	.9	.9	7
Male.....	1.1	1.2	4
Female.....	.6	.7	16
15-44 years.....	2.8	2.9	3
Male.....	2.1	2.2	3
Female.....	3.4	3.5	3
45-64 years.....	3.8	4.3	13
Male.....	4.4	4.9	10
Female.....	3.2	3.7	16
65 years and over.....	6.9	9.2	34
Male.....	6.8	9.1	34
Female.....	6.9	9.3	34

¹ The interview period was May 1954-April 1955 covering hospitalization in prior 12-month periods. Hospitalization of newborn is excluded. The adjusted rates underestimate male utilization more than female utilization because this was true of the San Jose ratios used in the adjustment.

² Days of care in non-Federal general hospitals per 1,000 persons divided by 256 (70 percent of 365). Average occupancy in California non-Federal general hospitals is 70 percent.

³ Calculated from bed occupancy rates with two decimal places.

SOURCE: California health survey, bureau of chronic diseases, California State Department of Public Health.

pected statewide during the period covered by the California health survey.

5. The estimate derived from San Jose experience is conservative since it excludes hospitalization of residents outside the local community.

6. The adjustment using San Jose ratios brings the estimate of total hospitalization based on the California health survey data into closer agreement with data from other sources, as shown in table 7.

Other Approaches to the Problem

The San Jose data measure the general magnitude of the effect on hospitalization rates of

the omission of decedents in household surveys, and we believe they give an adequate, conservative adjustment of the California health survey data. However, there is need to develop better methods for overcoming limitations due to the omission of persons who have died. Ratios existing in one community during one year cannot be applied with confidence to future years or to the Nation as a whole. Another consideration is that omission of decedents affects findings on illness, disability, and other items as well as findings on hospital use.

One approach to the problem is to supplement the household survey with a study of a sample of deaths. Death certificates provide what can be considered a complete universe and are easily sampled. A more difficult problem is how to obtain the additional information on hospital care and perhaps on other subjects.

By mail or by interview, information might be obtained from the physician certifying the death, from the informant named on the death certificate, or from the hospital or institution where the death occurred. Further information might be obtained by followup of these sources. All these methods should be tried and evaluated.

Table 6. Percentage of population according to age and sex, San Jose, October 1952, and California, May 1954-April 1955

Age and sex	San Jose	California
All ages.....	100	100
Male.....	47	49
Female.....	53	51
0-14 years.....	24	29
Male.....	12	15
Female.....	12	14
15-44 years.....	44	42
Male.....	20	20
Female.....	24	22
45-64 years.....	22	21
Male.....	11	10
Female.....	11	11
65 years and over.....	10	8
Male.....	4	4
Female.....	6	4

SOURCES: U. S. Bureau of the Census, Current Population Reports, series P-28, No. 464, October 24, 1952; California health survey, bureau of chronic diseases, California State Department of Public Health.

For data on hospital use, we have decided that the following method probably will be the most accurate and also the most feasible, at least for a special study in California:

1. Enlist the cooperation of a sample of local registrars of death (health officers), who in turn will obtain the cooperation of funeral directors.

For most California deaths the funeral director obtains information for the death certificate from the family and, for hospital deaths, communicates with the attending physician and with the hospital.

2. At the time the death certificate is prepared, have the funeral director obtain the

Table 7. Number of admissions and days per year in non-Federal general hospitals in California: comparison of findings from three sources

Source	Admissions		Days		Definitions
	Number	Rate per 1,000 population ¹	Number	Rate per 1,000 population ¹	
California health survey (interview period May 1954-April 1955 covering hospitalization for May 1953-April 1955):					
Unadjusted	1, 048, 000	² 86	8, 737, 000	³ 713	Care reported in (a) community ⁴ hospitals classified as general or maternity in the list of hospitals licensed by the California Department of Public Health and (b) county and city hospitals. Excludes care of persons with no usual place of residence outside an institution. This probably excludes all of the domiciliary care and a large but unknown proportion of the long-term chronic and nursing care given by county hospitals.
Adjusted to include estimated care to decedents.	1, 117, 000	92	9, 809, 000	801	
Adjusted to include estimated care to decedents and estimated 1-day stays not overnight. ⁵	1, 201, 000	98	9, 893, 000	808	
Bureau of hospitals, California State Department of Public Health (1954 for community ⁴ hospitals; 1954-55 for county and city hospitals).	1, 425, 089	116	9, 629, 301	786	Includes all non-Federal general and special ⁶ hospitals in California. Within these hospitals excludes services in beds assigned for tuberculosis, psychiatric, chronic, nursing, and domiciliary care.
American Hospital Association (year ending September 30, 1954).	1, 258, 790	103	10, 573, 320	863	Includes non-Federal short-term general and special ⁶ hospitals listed by the American Hospital Association in the Administrators Guide Issue, August 1955. Within these hospitals includes services in beds assigned for tuberculosis, psychiatric, chronic, nursing, and domiciliary care.

¹ Rates based on population estimate of California health survey (12,250,000 resident noninstitutional population exclusive of persons living on military posts).

² Plus or minus 5 percent, twice the estimated coefficient of variation.

³ Plus or minus 12 percent, twice the estimated coefficient of variation.

⁴ Proprietary, nonprofit, and district hospitals plus University of California Hospital (State).

⁵ One-day stays not overnight are estimated to be 84,000 admissions and days, based on San Jose finding that 93 percent of admissions were overnight or longer.

⁶ Excludes tuberculosis and mental hospitals.

names and addresses of any hospitals in which the decedent spent one or more days during the year of death.

3. Check with the hospitals named to verify the information and to obtain additional data on such items as number of days and treatment received.

Another approach to the problem is prospective study of the surveyed population to determine which persons die in the 12 months following interview and the amount of hospitalization used by these persons during that period. This is not an efficient method if its only purpose is to adjust data on hospital use. However, in California the method is under consideration for other purposes and may incorporate a test of the San Jose ratios. The major disadvantages of the method are (a) a small sample of deaths, (b) a relatively costly followup to locate informants and obtain the desired data, and (c) a later time period from the period covered in the household survey.

Summary and Conclusions

From hospital records, the actual hospital experience (in the four local general hospitals) of the 984 residents of San Jose, Calif., who died in the fiscal year 1952 was determined. This information was used to adjust the findings of the 1954-55 California health survey, a statewide household survey covering the living population.

For all ages the adjustment increased the estimate of hospital admissions by 6 percent

and the estimate of hospital days by 10 percent. For persons aged 65 years and over, the adjustment increased both the rate of admissions and the rate of days in the hospital by approximately one-third.

From this study, it is evident that persons who die during a 1-year period use hospital care during that period in amounts too great to be ignored in planning medical facilities. If household survey findings are to be used to describe the total amount of services provided by hospitals, it is necessary to add the experience of persons who have died.

Adjustment of the California health survey data on the basis of the San Jose data appears to give a reasonable estimate of total annual use of general hospitals in California for the period studied. However, further study is needed to test the accuracy of this adjustment and also to develop methods of adjustment that would be applicable whenever household surveys are done.

REFERENCES

- (1) Weissman, A.: California morbidity research project. *Am. J. Pub. Health* 42: 711-716, June 1952.
- (2) Belloc, N. B.: Validation of morbidity survey data by comparison with hospital records. *J. Am. Statist. A.* 49: 832-846, December 1954.
- (3) Falk, I. S., and Brewster, A.: Hospitalization insurance and hospital utilization among aged persons: March 1952 survey. *Soc. Security Bull.* 15: 3-17, November 1952.
- (4) California State Department of Public Health: *Hospitals for California*. Berkeley, Calif., 1956.

Footnote on Asian Influenza

A report of Asian influenza affecting 2,770 recruits and more than 70 percent of the crew of a naval vessel at San Diego appeared in the September 1957 issue of *Public Health Reports*, page 769.

The vessel had not been to the Far East or to any other foreign area. It is reported that the infection was present in San Diego before the ship left the port on June 6, 1957.

Health Officers' Meeting On Asian Influenza

A MEETING of State and Territorial health officers, called by Surgeon General Leroy E. Burney to discuss Asian influenza, was held on August 27-28, 1957, in Bethesda, Md., and Washington, D. C.

Participating members divided into committees to discuss major aspects of the problem and to develop recommendations and guidelines. Certain of their recommendations are briefed in the following paragraphs.

Collection of Specimens

In the identification of an outbreak, throat washings and serum should be submitted from at least 12 clinical cases, accompanied by clinical abstract and data on how specimens were taken. The specimens should be gathered in the face of an explosive outbreak of upper respiratory illness within the first 3 days of illness and submitted through the State health authority.

Epidemic Surveillance

Epidemic investigation of influenza should include, but not be limited to, the symptoms, etiology (by laboratory confirmation of the representative sampling), complications, mortality, and the age groups involved.

States should plan to gather intelligence rapidly regarding the occurrence of pneumonia. Since bacterial identification by sputum specimens is as important as virus diagnosis, it is further recommended that sputum specimens for bacterial studies and antibiotic sensitivity be taken as soon as pneumonia is suspected. The pneumonia rate in the extremes of age should be used as a sensitive index to assess the severity of an epidemic.

National Reporting System

Each State should submit a weekly situation report to the Public Health Service for operational purposes. This information can be added to the usual weekly telegram to the National Office of Vital Statistics.

States should adopt a program of epidemic reporting by counties to the States and then on

to the Public Health Service; a standard method of gathering and reporting information on outbreaks; and a method of sampling absentee rates in selected schools and industries. To facilitate analysis of data and to aid local, State, and national management of the epidemic, States are urged to participate in the proposed Public Health Service reporting programs.

The Committee on Epidemic Intelligence, a subcommittee of the State and Territorial Health Officers Association, working with the Communicable Disease Center, has developed a number of proposed forms for the collection of information. These are available from the Communicable Disease Center. Every State health officer should get these forms and see how they can be applied to his own State and local communities.

Technical Assistance

Assistance from the Public Health Service in support of virus laboratories and State health departments should include provision of diagnostic material; training of laboratory personnel; and loan of epidemiological personnel if requested by the State.

The Public Health Service could also assist the States by planning for regional conferences concerning epidemic progress if needed.

Community Planning

The health officer should estimate the possible effect of an epidemic on his community and determine current or potential resources to meet the problems which may be created, keeping in mind the following:

1. Prevention, an immunization program to stop the spread of infection.
2. Care of a patient and his family, including (a) medical and nursing care of the patient in the home, (b) hospitalization of complicated or other special cases, and (c) home-making and feeding programs in households where the mother is a patient or all members of the household are ill at the same time.
3. Serious disruption of essential community services, including public safety, police and fire, public utilities, light, power, and telephones and transportation.

On the basis of these considerations, he should outline a plan for his community in cooperation with the medical society. The next step would be to bring into the campaign other community groups concerned or which have resources that might be useful. If a well-organized, effectively operating voluntary health council exists in the community, this probably would be the group. If not, a special ad hoc committee should be established, which may be the basis for a continuing local health council.

The health officer should confine his activities to those for which he is legally responsible. As to other essential community services, he should advise the head of his department of the possible effects on such services, so that the head of his government can take the steps that will assure a minimum disruption of community life. The health officer should stand ready to advise and act on the health aspects of community problems precipitated by the epidemic and referred to him by other existing governmental agencies.

This guideline also applies to the State health officer and State services and organizations.

Public Gatherings

There is no practical advantage in the closing of schools or the curtailment of public gatherings. However, in some instances there may be administrative reasons for closing schools due to illness of teachers, bus drivers, large absentee rates, and so forth.

Use of Local Resources

Each community is urged to make full use of local facilities and services, such as home nursing service, homemakers service, first aid and care of the sick, to supplement the care needed for ill persons in the home and to relieve the demand on hospitals.

Health officers should inform themselves of supplies and facilities available under civil defense in many communities which may be used in an epidemic if need be.

Home Care of Patients

Since the uncomplicated case of influenza runs less risk of cross-infections if cared for at home rather than in the hospital, maximum re-

Vaccination of Children

In children a high incidence of febrile but not dangerous reactions to the initial injection of vaccine may be expected. Most of the systemic reactions are related directly to the amount of vaccine given and occur within 24 hours of administration. Reactions are less frequent and milder following the second injection. Persons hypersensitive to egg should not receive the vaccine.

—*Excerpt from a statement by EDWARD C. CURNEN, JR., M.D., chairman, Committee on the Control of Infectious Diseases, American Academy of Pediatrics*

liance should be placed upon home care of those ill, and hospitalization limited, as far as possible, to those cases of influenza with complications or to those with other diseases which might be aggravated by influenza.

Epidemiological Information

The Public Health Service should supply epidemiological information on the national situation and also on a State by State basis. States should be informed of the vaccine available and released, both as to totals and by allocations to the States. Press releases issued by the Public Health Service concerning this topic should be sent directly to the States at the same time they are sent to regional offices.

Vaccination Program

A system of interstate allocation of vaccine based on a voluntary agreement with the manufacturers is recommended.

The Surgeon General should recommend that physicians give priority to:

- a) Those individuals whose services are necessary to maintain the health of the community.
- b) Those individuals necessary to maintain other basic community services.
- c) Persons with tuberculosis and others who in the opinion of the physician constitute a special medical risk.

The Committee on Influenza of the American Medical Association should be asked to as-

sist in implementation of these recommendations.

Advisory Committees

Each level of government is encouraged to establish advisory committees, broadly representative in nature, to consider which groups are deemed essential to maintain necessary services.

Vaccination of Children

Doses recommended are as follows: for pre-school children, 3 months to 5 years, 0.1 cc. intracutaneously or subcutaneously, repeated after an interval of 1 to 2 weeks; for children 5 to 12 years of age, 0.5 cc. subcutaneously, repeated after an interval of 1 to 2 weeks; for children 13 years of age and older, the dose for adults may be used.

Poliomyelitis and Influenza Vaccinations

The committee recommended that the poliomyelitis vaccination program and the influenza vaccination program be continued as independent and parallel programs.

National Commission on Influenza

The Surgeon General should appoint a national commission on influenza to identify research and other needs in relation to the effect of influenza on the civilian population of the Nation, and encourage, support, and coordinate, through existing channels, the planning and the execution of research and other activities designed to meet these needs.

This commission should consider not only the urgent problems in connection with the current epidemic, but also the long-range problems associated with the behavior of Asian and other strains of influenza during the next decade.

The commission should first study serious complications of influenza, particularly deaths, and the methods of their prevention.

The following participated in the plenary meetings:

Maj. Gen. S. B. Hays, Surgeon General of the Army; Dr. F. M. Davenport, director, Committee on Influenza, Armed Forces Epidemiological Board; Dr. M. R. Hilleman, chief, Department of Respiratory Diseases, Walter Reed Army Medical Center; and Dr. C. C. Dauer, medical adviser, National Office of Vital Statistics, Public Health Service.

Dr. K. E. Jensen, assistant chief, Virus and Rickettsia Section, Communicable Disease Center, Public Health Service; Dr. Roderick Murray, director, Division of Biologics Standards, Public Health Service; Dr. J. M. Andrews, director, National Institute of Allergy and Infectious Diseases, Public Health Service; and Frank Barton, secretary to the council on national defense, American Medical Association.

Dr. H. C. Lueth, chairman, Committee on Civil Defense, American Medical Association; Dr. D. A. Clark, chairman, Committee on Influenza, American Hospital Association; Dr. E. C. Curnen, chairman, Committee on Control of Infectious Diseases, American Academy of Pediatrics; and Col. D. M. Alderston, military assistant for professional services, Office of the Assistant Secretary of Defense (Health and Medical).

Col. Arthur Long, chief, Preventive Medicine Division, Office of the Surgeon General of the Army; Col. George Fair, chief, Preventive Medicine Division, Office of the Surgeon General of the Air Force; Capt. J. R. Seal, chief, Communicable Disease Branch, Bureau of Medicine and Surgery of the Navy; and Dr. W. H. Stewart, Assistant to the Surgeon General, Public Health Service, Dr. D. L. Finucane, director, Department of Public Health, District of Columbia.

The following were chairmen of the conference committees:

Dr. D. G. Gill, State health officer, Alabama State Department of Health; Dr. R. N. Barr, secretary and executive officer, Minnesota State Department of Health; Dr. F. D. Yoder, director of public health, Wyoming State Department of Public Health; and Dr. T. F. Sellers, director, Georgia Department of Public Health.

A limited edition of the proceedings has been published by the Public Health Service and distributed widely. The remaining copies may be obtained free of charge from Public Inquiries Branch, Office of the Surgeon General, Public Health Service, while the supply lasts.

Prevalence of Four Enteropathogenic *E. Coli* Groups In Preschool Children

W. T. COOLEY, M.S., and
D. J. SCHLISSMANN, M.S.

THE WORK of Bray (1) in 1945, and Bray and Bevan (2) in 1948, focused attention on a number of *Escherichia coli* serotypes as causative agents of diarrhea. Since that time, a number of reports in Great Britain (3-9) and the United States (10-16) have documented specific evidence of the association of certain *E. coli* groups with clinical cases of diarrhea.

While many of these studies included sampling of populations exhibiting no diarrheal symptoms, the cultures were largely obtained from contacts, children reporting to clinics for reasons other than diarrhea, or from children in institutional environments such as orphanages and hospitals. Limited epidemiological information is available, however, on the age-specific prevalence of the enteropathogenic *E. coli* in normal populations, secondary attack rates, duration of carrier state, and case-to-carrier ratios.

In 1956, a limited study of the prevalence of four enteropathogenic *E. coli* groups in healthy preschool age children was conducted in eastern Kentucky by the Cumberland Field Station of the Communicable Disease Center, Public Health Service. The investigations were part of the diarrheal disease studies of the station.

Procedures

Public health nurses and epidemiological aides have visited households in 6 coal mining camps and 5 rural hamlets in eastern Kentucky at monthly intervals since September 1954 to obtain histories of diarrheal disease within entire families. On each visit they also obtained rectal swab cultures from preschool children to determine the prevalence of *Shigella* and *Salmonella* infections. As an adjunct to the deter-

mination of diarrheal attack rates and *Shigella-Salmonella* prevalence in the study populations, a concurrent study was begun in February 1956 in four of the study populations to determine the prevalence of four enteropathogenic *E. coli* groups in preschool children. *E. coli* 026:B6, 055:B5, 0111:B4, and 0127:B8 were selected for study because they had been most frequently associated with outbreaks of infantile diarrhea by previous investigators. Forty-three preschool children in each of 3 coal mining camps and 1 rural hamlet, making a total of 172 children, were selected for the 6-month comparative study. The four areas were selected as representative of the diversity of housing conditions observed in eastern Kentucky and because considerable variations in both morbidity rates and prevalence of *Shigella* had been previously observed in them. The ages of the children in the four areas ranged from 1 month through 5 years, with approximately equal numbers of children in each yearly age group.

At the time the monthly rectal swab cultures were obtained for detection of *Shigella* and *Salmonella* in the preschool children of the four selected areas, one-fourth of a MacConkey agar plate was streaked with the cotton swab for the *E. coli* studies. The inoculated plates were brought to the laboratory within 4 hours, where the streaking was completed with a wire loop. Attempt was made to obtain well-isolated colonies on most of the agar surface. The cultures were incubated for 24 hours, and each of 20 typical *E. coli* colonies was fished to a drop of 0.5 percent saline solution on a smooth slide and tested against pooled antisera. This polyvalent serum was prepared by mixing equal amounts of *E. coli* 026:B6, 055:B5, 0111:B4, and 0127:B8 antisera with 0.5 percent saline solution to obtain a 1:10 dilution of each specific antiserum. When a colony was found which gave an agglutination, 20 additional colonies were transferred to tubes of triple-

Mr. Cooley is in charge of laboratory services of the Berea College Hospital, Berea, Ky., and Mr. Schliessmann, who was chief of the Cumberland Field Station at the time of this study, is currently chief of the State Aids Section, Technology Branch, Communicable Disease Center, Public Health Service.

sugar-iron agar and heart infusion agar. Final biochemical and serologic identification was carried out according to the recommendations of Edwards and Ewing (17). When a child was found to be carrying 1 of these 4 serotypes, an effort was made to obtain additional cultures from family contacts. A total of 1,000 survey cultures and 28 cultures from family contacts were examined between February 6 and August 20, 1956.

Results

Of the 1,000 cultures examined, 13 (1.3 percent) were positive for 1 of the 4 *E. coli* groups, and 59 (5.9 percent) were positive for *Shigella*. *Salmonella* was recovered from three cultures (see table). Because of the limited number of *E. coli* isolations, no seasonal variation in their occurrence was observed.

E. coli 055, isolated from 6 children, was the most common of the enteropathogenic groups encountered. Group 0111 was identified from 4 children and *E. coli* 0127 from 3 others. Dr. W. H. Ewing examined four of the six 055:B5 cultures and classified them all as serotype 055:B5:H6. All the 0111:B4 strains were 0111:B4:H12. Six of the positive children were 2 years old, 4 were in the 1-2-year category, 2 were 3-4 years old, and 1 was less than a year old. Enteropathogenic *E. coli* were not isolated from any of the 13 positive children on subsequent cultures 1 month following the ini-

tial isolation. Cultures of 6 familial contacts of 1 positive child resulted in isolation of the same *E. coli* group from 2 siblings. Cultures obtained from 22 siblings of 6 other positive children were negative. None of the positive children gave a history of diarrhea during a period of 4 weeks before or 2 weeks after culturing.

Reported diarrheal attack rates, ranging from 11 to 92 per 1,000 person-months experience, were associated with the range of 2.1 to 10.6 percent in *Shigella* isolations. The percentage of enteropathogenic *E. coli* isolations (1.1 to 1.6 percent) was approximately the same in the four areas.

Discussion

The low percentage of cultures yielding any of the four enteropathogenic *E. coli* groups is typical of the results of earlier studies on cultures from nondiarrheal patients in hospitals and clinics. Giles and associates (4) isolated *E. coli* 055 ten times from 324 healthy infants; Stevenson (7) recovered *E. coli* 0111 nine times in 1,024 adults; Taylor and Charter (9) found four *E. coli* 086 groups among 255 well babies; and Graber and Dunlap (12) failed to recover any of 9 enteropathogenic serotypes from 410 pediatric patients in the absence of diarrhea.

Two factors may have contributed to the infrequent isolations of enteropathogenic *E. coli* in the present study. It was necessary to use

Comparison of diarrheal attack rates and isolation rates of *E. coli* and *Shigella* in preschool children in eastern Kentucky, February-August 1956

Area	Bacteriological examinations					Reported morbidity (0-5 ages)		
	Number of cultures	Positive for <i>Shigella</i>		Positive for <i>E. coli</i>		Person-months experience	Number of cases	Rate per 1,000 person-months
		Number	Percent	Number	Percent			
Wheelwright.....	183	4	2.2	2	1.1	183	2	11
Weeksbury ¹	281	6	2.1	3	1.1	281	5	18
Wayland.....	243	18	7.4	4	1.6	243	10	41
Jacks Creek ²	293	31	10.6	4	1.4	293	27	92
Total.....	1,000	59	5.6	13	1.3	1,000	44	44

¹1 *Salmonella paratyphi* B and 1 *Salmonella typhimurium* isolated.

²1 *Salmonella montevideo* isolated.

rectal swabs in the survey in order to handle a larger number of cultures. This method has proved satisfactory for *Shigella* work, but there is still disagreement among workers in the field as to its desirability in *E. coli* studies. Second, because of the large amount of confirmatory work that must be done with the *E. coli* group, it was necessary to use only one MacConkey agar plate for each individual and to limit the number of colonies being screened to 20 per plate. This number of colonies would seem to us to be adequate if 4 or 6 types of *E. coli* are equally distributed on a plate. However, if a particular serotype is present in very small numbers, there is a probability that it will be missed in the procedures employed.

The rate of occurrence of the four *E. coli* serotypes did not correlate with the reported diarrhea morbidity from the study population, in contrast to the correlation of *Shigella* incidence with morbidity (see table). If we may assume that the four enteropathogenic *E. coli* groups were readily recovered by the laboratory tests employed, it is apparent that these particular *E. coli* groups did not contribute appreciably to the diarrheal morbidity in the populations under study. Although the numbers are too small to draw definite conclusions, it is notable that in only 1 of 7 instances was there any evidence of intrafamilial spread. Also of note was the observation that all 13 positive individuals were negative when cultured 1 month later. This low rate of transmission within the family and the apparently short carrier period could possibly be accounted for by the absence of diarrhea. Histories of the positive children indicated that they had no more than one bowel movement in 24 hours. This lessened appreciably the possibility of cross- and auto-infection hazards compared with conditions existing in a household where an ill child has 6 to 12 loose movements during the same period.

Summary

A 6-month survey of the prevalence of *Shigella* and *Salmonella* and four enteropathogenic *E. coli* groups in 172 healthy preschool children was conducted in eastern Kentucky in four areas having diverse housing and sanitary

facilities. Fifty-nine *Shigella*, 3 *Salmonella*, and 13 enteropathogenic *E. coli* were isolated from 1,000 cultures.

Of 13 positive *E. coli* isolations, 6 were group 055, 4 were 0111, and 3 were 0127. *E. coli* 026 was not recovered. None of the 13 positive children gave a history of being ill, and all subsequent monthly cultures were negative. In 28 cultures of siblings of 7 positive children, only one instance of intrafamilial spread was observed.

The four enteropathogenic *E. coli* groups did not contribute appreciably to the diarrheal attack rates in the areas sampled.

REFERENCES

- (1) Bray, J.: Isolation of antigenically homogeneous strains of *Bact. coli* Neopolitanum from summer diarrhea of infants. *J. Path. & Bact.* 47: 239-247 (1945).
- (2) Bray, J., and Bevan, T. E. D.: Slide agglutination of *Bacterium coli* var. Neopolitanum in summer diarrhea. *J. Path. & Bact.* 60: 395-401 (1948).
- (3) Charter, R., and Taylor, J.: Cultural and serological reactions of strains of *Bact. coli* isolated from babies. *J. Path. & Bact.* 64: 729-734 (1952).
- (4) Giles, C., Sangster, C., and Smith, J.: Epidemic gastro-enteritis of infants in Aberdeen during 1947. *Arch. Dis. Childhood* 24: 45-53 (1949).
- (5) Magnusson, J. H., Laurell, G., Trisell, E., and Werner, B.: Aureomycin treatment of infantile diarrhoea and vomiting. *Brit. M. J. No.* 4667: 1398-1400, June 17, 1950.
- (6) Smith, J.: The association of certain types (A & B) of *Bact. coli* with infantile gastro-enteritis. *J. Hyg.* 47: 221-226 (1949).
- (7) Stevenson, J. S.: *Bact. coli* D433 in cases of diarrhoea in adults. *Brit. M. J. No.* 4671: 195-196, July 15, 1950.
- (8) Taylor, J., Powell, B. W., and Wright, J.: Infantile diarrhoea and vomiting. A clinical and bacteriological investigation. *Brit. M. J. No.* 4619: 117-119, July 16, 1949.
- (9) Taylor, J., and Charter, R.: The isolation of serological types of *Bact. coli* in two residential nurseries and their relation to infantile gastro-enteritis. *J. Path. & Bact.* 64: 715-728 (1952).
- (10) Ewing, W. H., Tanner, K. E., and Tatum, H. W.: A new serotype of *Escherichia coli* associated with infantile diarrhea. *Pub. Health Rep.* 70: 107-114, February 1955.
- (11) Ferguson, W. W., and June, R. C.: Experiments on feeding adult volunteers with *Escherichia*

- coli* 111, B4, a coliform organism associated with infant diarrhea. Am. J. Hyg. 55: 155 (1952).
- (12) Graber, C. D., and Dunlap, S. G.: Incidence of serologic types of *Escherichia coli* associated with infantile diarrhea among pediatric patients in the Denver area. J. Lab. & Clin. Med. 44: 416-421 (1954).
- (13) June, R. C., Ferguson, W. W., and Warfell, M. T.: Experiments in feeding adult volunteers with *Escherichia coli* 55, B5, a coliform organism associated with infant diarrhea. Am. J. Hyg. 57: 222 (1953).
- (14) Modica, R. I., Ferguson, W. W., and Ducreg, E. F.: Epidemic infantile diarrhea associated with *Escherichia coli* 111: B4. J. Lab. & Clin. Med. 39: 122 (1952).
- (15) Neter, E., and Shumeyov, C. N.: *E. coli* serotype D433: Occurrence in intestinal and respiratory tract, cultural characteristics, pathogenicity, sensitivity to antibiotics. Proc. Soc. Exper. Biol. & Med. 75: 504 (1950).
- (16) Neter, E., Korns, R. V., and Trusell, R. E.: Association of *Escherichia coli* serogroup 0111 with two hospital outbreaks of epidemic diarrhea of the newborn in New York State during 1947. Pediatrics 12: 377 (1953).
- (17) Edwards, P. R., and Ewing, W. H.: Identification of Enterobacteriaceae. Minneapolis, Minn., Burgess Publishing Co., 1955.

Standard for Enrichment of Milled Rice

A standard for enriching milled rice was published by the Food and Drug Administration on August 27, 1957, specifying vitamins and amounts to be added by rice packers.

The action is the outcome of recommendations by the National Research Council and is based on Food and Drug Administration proposals published December 28, 1956, and on written comments on these proposals.

Under the standard, each pound of milled rice labeled "enriched" must contain 2 to 4 milligrams of thiamine, 1.2 to 2.4 milligrams of riboflavin, 16 to 32 milligrams of niacin, and 13 to 26 milligrams of iron. The cost of these enrichment ingredients would be about 5 cents per 100 pounds of rice. The rice packer who chooses to enrich his product further with vitamin D, or calcium, or both, must add 250 to 1,000 U. S. P. units of vitamin D and 500 to 1,000 milligrams of calcium, to each pound of his product.

At present, no rice on the market fully conforms to the standard. South Carolina's compulsory enrichment regulation matches the new Federal standard in all aspects except that the use of riboflavin is optional.

The standard allows two enrichment processes. In one process, a proportion of the kernels is impregnated with the vitamins. The standard requires packers of this product to apply tests for insuring that the loss in rinsing is kept to a minimum. In another process, all the rice is coated with the enriching ingredients. In this case, the product must be labeled with the caution against rinsing before or draining after cooking.

The standard becomes effective 6 months after publication unless objections are made. Thirty days are given to file objections and to request a public hearing.

New dimensions of learning in a free society

ON the occasion of the inauguration of Dr. Edward H. Litchfield as chancellor of the University of Pittsburgh, May 9-11, 1957, the campus was the setting for a series of distinguished lectures and seminars, including a seminar given with the dedication of the new Graduate School of Public Health.

Among the guests and speakers were:

Charles H. Best, M.D., director, Charles H. Best Institute, University of Toronto; John C. Bugher, M.D., director for medical education and public health, Rockefeller Foundation; G. Brock Chisholm, M.D., former Director General, World Health Organization; Carlyle F. Jacobsen, Ph.D., executive dean for medical education, State University of New York; Paul Mellon, chairman, A. W. Mellon Educational and Charitable Trust; Fillmore H. Sanford, Ph.D., associate director, Joint Commission on Mental Illness and Health, Cambridge, Mass.; Warren Weaver, Ph.D., vice president for the natural sciences and medical sciences, Rockefeller Foundation; Abel Wolman, D.E., professor of sanitary engineering, School of Hygiene and Public Health, Johns Hopkins University.

A few outstanding quotations from the speakers are given below. The full text is to be published by the University of Pittsburgh.

Stakes in Nuclear Power

A great discontinuity in human experience occurred when science first realized, just a few years ago, that fission and fusion of atomic nuclei can be accomplished by man. That discovery suddenly lifted the equation $E=c^2m$ from its previous status as an innocent algebraic oddity to the level of a scientific and social revo-

lution. Whether or not man is going to solve all his problems, in a horrid negative sense, by destroying civilization with nuclear bombs is as yet uncertain. But what is quite certain is that, provided we do go on existing, we will in the future live in a new physical environment . . .

Medical X-rays, fallout from weapons testing, and the undesirable but minor oddments of radiation we receive from other sources are, however, only part of the story. What seems to me of really major importance to the public health problem of the future is the clearly emerged fact that nuclear power installations, on a large and widely dispersed scale, have to be accepted as assured. In October 1956, the switch was closed on the first British power reactor at Calder Hall. It produces somewhat under 100,000 kilowatts. By the end of 1957 seven more power reactors are expected to be operating. But by 1965 the British, in accordance with recently increased plans, expect to have 24 power reactors in use, totaling approximately 6 million kilowatts of output in energy.

The total world requirements of energy for the three main demands of comfort heating, of process heating, and of power are something like 4 billion tons of coal equivalent at the present time. Fifty years from now it seems likely that this requirement will have become at least five times as great; and, as was remarked in a *Fortune* article a few years ago, "Everywhere the need for power bursts through the most careful estimates." We see that nuclear fission can even now compete, under many circumstances, with coal. It is almost impossible to believe that controlled nuclear fusion will not be achieved; and there are even hints, coming

out of the Berkeley laboratories this past winter, that light elements may eventually enter the practical fusion picture. In other words, we might as well face it. We are, and in a truly big way, in for a nuclear power future.

This new nuclear future will pose a large set of new problems for public health. Garbage disposal occupied the attention of Mr. Shattuck a hundred years ago, but the public health engineer of tomorrow must be prepared to cope with radioactive garbage. An array of new regulations will clearly be necessary to control location, shielding, protection against accident, minimizing of risk in the transport of hot material, dispersal and disposal of radioactive waste, and so on. The radiation exposure history of an individual may very possibly turn out to be, in this new future, the most critical item of individual health data. Concentration of radioactive isotopes by sea organisms; storage of long-lived isotopes in the soil, in vegetation, and in dairy products; the slow accumulation of internal emitters, as strontium-90 gets built into our bones; the risk of increased incidence of leukemia; the general influence of radiation exposure in shortening life expectancy; and perhaps of the gravest, because of the most persistent, importance, the genetic damage caused by radiation—these are clearly problems of first magnitude.

At the present moment we can clearly see these problems facing us in ever increasing future impact. And at the present moment we simply do not have the organization, the personnel, or, most important of all, the knowledge with which to meet these problems.

It is all too clear that we must greatly accelerate our activities in that general field designated as radiation biology. It is equally clear that we have to know a great deal more about genetics, both at the most general and fundamental levels and at the more special, the specially difficult and the particularly relevant, level of human genetics.

I dare to suggest—indeed I run the risk of urging—that these may well be the most important public health problems of the next 50 years. The physical sciences have, in one sense, been guilty of creating these problems for you. Public health, medical science, biology, and the physical sciences must team up, in a new and

closer and more effective comradeship, to meet these formidable challenges. The stakes are no trivial prizes of comfort or convenience. The stakes are survival.

—WARREN WEAVER

Sources of Social Infection

Of course we, in the wealthy countries, take it for granted that our local customs are better than those of the so-called underdeveloped countries. Many of our people are astonished to find that in Asia, for example, there are to be found some techniques and methods, particularly in the fields of mental and social health, far superior to ours. We know that maternal deprivation, that is, the loss even temporarily, of physically close, warm mother love, is a potent cause of physical, mental, and social ill health appearing in infancy, childhood, adolescence, or later life. The World Health Organization report, *Maternal Care and Mental Health*, by John Bowlby in 1951 and his summary in the Penguin book, *Child Care and the Growth of Love*, in 1953 document that knowledge. Much of our recent concern for mental and social health has been for early diagnosis of emotional disturbance, particularly in the early school years. It is well known, however, that in most cases the serious and often irreversible damage has been done before school age. Diagnosis of mental illness in childhood is not prevention any more than early diagnosis of cancer or tuberculosis is prevention. Diagnosis may lead to the recognition of causes, but only elimination of the cause or causes is prevention.

Though we know all this we still, even in some of our recently built hospitals, continue to keep newborn babies under glass in nurseries, allowing them to be with their mothers only for the short periods necessary for nursing. We still take babies and small children suffering from illness or injury into hospitals without their mothers, a procedure we know to be destructive to the child's physical, mental, and social development. In some extreme cases we even limit the hours in which mothers are allowed to visit their own children, sometimes to as little as 3 or 4 hours a day. Probably no young child can survive such an experience without some damage to his development.

In contrast, in most Asian, African, and the less highly "developed" European countries, babies are born at home and cared for entirely by their mothers, or in hospitals where the baby remains in bed with the mother or in a cradle close beside her or slung between the upward extended footposts of the bed, always within reach of the mother. Actually this system is far more efficient than ours, requiring far fewer trained nurses and less space, and insuring faster development and recovery from illness or injury. Relative freedom from damage to the necessary close mother-baby relationship is the most important advantage of that ancient system. When the mother with her first baby goes home from the hospital in those countries, she has none of the anxieties, tensions, or awkwardness so many of our new mothers show when they have only been taught to bathe the baby just before leaving the hospital. One of our barriers to better practices in this mother-baby relationship is the unwillingness some nurses show in giving up the babies to the mothers, but it is not sound practice to sacrifice the baby to the emotional desires of the nurses.

Unfortunately, we have succeeded in convincing many of the medical and nursing professions and the hospital architects of many countries that our ways are best, most modern, and most efficient. Most of the Communist countries, for example, have followed us in our hospital architecture and mistaken treatment of babies and children, still build nurseries in maternity hospitals, and in many cases do not provide accommodations for mothers in children's hospitals. It is encouraging to see that a few, but still only a few, of our maternity and children's hospitals in North America are beginning to allow mothers to have their newborn babies with them, and more rarely, even to stay in the hospital with their ill children.

On the basis of reliable evidence, it is in this area that we should be working most earnestly to try to reduce our heavy load of juvenile delinquency and other symptoms of mental and emotional ill health. As Bowlby puts it: "Deprived children, whether in their homes or out of them, are the source of social infection as real and as serious as are carriers of diphtheria or typhoid." In this enormously important aspect of public health we in North America are

among the world's most backward people. We are still largely under the influence of obsolete attitudes and are finding it very difficult to change, though the damage we do our children has been obvious for some time.

This type of damage is of course, from the point of view of world peace and security, and even racial survival, far more dangerous than smallpox, diphtheria, typhoid, yellow fever, or malaria. We cannot expect children deprived of close mother love to be able to develop, to be able to "live harmoniously in a changing total environment," unless indeed they are unusually fortunate in other aspects of the early emotional situation, but we should remind ourselves that that ability has been included in the prescription of minimum requirements for peace and security, written by the nations of the world in setting up the United Nations and its specialized agencies.

—BROCK CHISHOLM

A Tribute to the Social Sciences

Since the war several universities have new medical centers. The manner of their beginning is interesting, for in each instance there has been studied concern for the relation of the health sciences to the general disciplines of the parent university and to the community which these schools will serve. At the University of California in Los Angeles, at the University of Florida, Gainesville, and at the University of Kentucky, Lexington, the planning of the new schools was a university undertaking and not solely the responsibility of a quickly gathered group of department chairmen in the medical disciplines. The faculties of the arts and sciences and of the other professional schools shared in defining the goals and the relationship of the health center to the university and the community. Hence, it is not too startling to find that at the University of Florida the professor of medicine is an active participant in the teaching of undergraduate students in the department of philosophy; nor is it surprising that the building plans for this new health center include a wing for the social and behavioral sciences.

A few years ago, Kentucky determined to establish a medical center for education in the

several health professions. The initial appointees of staff to plan and guide this development are striking. The dean is a former county health officer with 10 years of successful medical school administration. The first appointments to the faculty were not chairmen of either basic science or clinical departments; however, they possessed these qualifications: an internist experienced in comprehensive family care programs; a Ph.D. in sociology who, incidentally, had earned a master's degree in public health; and a Ph.D. in economics whose special competence is the financing and cost analysis of medical care. Dean Willard's initial appointments are not a devaluing of the traditional disciplines in medicine. Rather, they are a tribute to the social sciences for their contribution to understanding the meaning of a medical center and health education within a university and as integral parts of the community.

—CARLYLE F. JACOBSEN

The Meaning of Industrial Health

In the practical definition of program for the University of Pittsburgh Graduate School of Public Health, the letter of gift stipulated, among other things, that the school is "to em-

phasize occupational and industrial health and hygiene; health generally connected with or related to Pittsburgh and similar urban industrial areas; and research with reference to problems arising in connection with the foregoing."

As a layman I am assured that "clinical materials" are essential to make any school of the health professions flourish. If so, Pittsburgh should be the world capital for the study of occupational health. Here are the vast human resources of its industry. Here are the Mellon Institute of Industrial Research, the Industrial Hygiene Foundation, the corporate research laboratories, the Carnegie Institute of Technology and its School of Industrial Administration.

The school is training physicians for the field of industrial health. But industrial health no longer means merely the surgical treatment of accidents on the job. It means prevention, the maintenance of health, the extension of the concepts of public health in the broadest sense. All industry, all labor, their interest in steady production, steady jobs, and steady pay, have a direct interest in this scientific institution which is concerned with basic research and postgraduate teaching.

—PAUL MELLON

New Tribal Relations Officer



Forrest J. Gerard has been appointed Tribal Relations Officer of the Public Health Service's Division of Indian Health, succeeding Peru Farver, who retired from Federal service in February 1957. Since June 1955, he has served as the executive secretary of the Wyoming Tuberculosis and Health Association in Cheyenne.

Mr. Gerard, a member of the Blackfoot tribe, will be responsible for relations between some 250 Indian tribes and the Federal Government's Indian health program, which was transferred in 1955 to the Department of Health, Education, and Welfare from the Department of the Interior.

After receiving a bachelor of arts degree in business administration from the Montana State University in 1949, he worked for 5½ years in Helena, Mont., first on the staff of the Montana State Department of Public Instruction and later with the Montana Tuberculosis Association.

Public Health Disaster Aid *in the* Rio Grande Flood of 1954

F. J. VON ZUBEN, Jr., B.S., G. R. HAYES, Jr., M.S., and E. C. ANDERSON, M.S.

AS HURRICANE ALICE, the first hurricane of 1954, whirled out of the Gulf of Mexico and across a sparsely inhabited section of Mexico below Brownsville, Tex., inflicting only minor damage to the Brownsville-Matamoros area, the residents of Texas and northern Mexico relaxed and began enjoying the long-needed rains that came to the lower Rio Grande Valley. But Hurricane Alice was not to be dismissed so lightly. As the main body of the storm moved northwestward across Mexico and into the Pecos Valley of Texas, it pushed huge masses of moist air some 650 miles inland from the mouth of the Rio Grande. Great torrents of water were released on the watershed of the Rio Grande in both Texas and Mexico as this storm blew itself out in the Pecos Valley.

On Sunday, June 27, torrential rains fell on

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John R. Bagby, Jr., of the Technology Branch, Communicable Disease Center, assisted in compiling the information contained in this report.

Crockett County, and a 36-foot wall of water rushed down Johnson Draw to Devils River and on to the Rio Grande to join waters from northern Mexico and the Pecos Valley. As much as 34 inches of rainfall was observed during the storm period at points 22 to 40 miles northward from Langtry, Tex. The Pecos River crested at the Southern Pacific Railroad high bridge 16 miles east of Langtry at 96.24 feet, and one of the greatest natural disasters in the history of the southwest was on the move.

Extent of Flood Damage

At 5 a.m. on June 28 the floodwaters in Johnson Draw crested in Ozona, isolating the town and driving approximately one-third of the population from their homes. Many homes were destroyed by the rushing water, and the number of deaths was eventually established at 22. Many head of livestock were lost, and many of the carcasses were left in or near the town by the receding floodwaters. Three fires in the city burned out of control because fire hydrants were submerged by floodwaters.

At Del Rio the Rio Grande began to rise on June 27 and reached its crest of 38.25 feet at 9:30 a.m. the next day. Comparatively little damage was suffered on the American side of the river, since Del Rio is some distance away. Very little rain fell in this area, so the San Felipe Creek, from which the city obtains its water supply, did not rise, and the water plant remained in continuous operation. Only a few

families residing in bottom lands adjacent to the river had to be evacuated.

Acuña, in Mexico, across the Rio Grande from Del Rio, was devastated. Most of the residents heeded advance warnings and fled to the hills nearby, but they suffered severe property losses. The approach to the international bridge was inundated and washed out. The Quemado Valley, above Eagle Pass, was flooded, and the irrigation system was so severely damaged that water from the river could no longer be diverted into the canal system. Many residents of the valley use the canal water for domestic purposes.

The flood crest moved on down the river, reaching 53.51 feet at Eagle Pass at 4 a.m. on Tuesday, June 29. At this point it exceeded the previous high of 49 feet, which had occurred on September 2, 1932.

Operation of the water treatment plant at Eagle Pass was discontinued at 3:30 a.m. Two emergency gasoline-driven sump pumps had been installed previously to protect the main electrical control panel, the wash water pumps, and the motors of the vertical high-lift pumps, which were all located in the basement. The shower, toilet, and other plumbing fixture drains had been plugged and the doors calked and sandbagged to prevent entrance of water. In spite of these precautions, leaks in the basement wall increased until the safety of personnel was threatened, and the plant was closed.

The entire business section of Eagle Pass was flooded to a depth of 8 to 10 feet, and the city's sewage treatment facilities were completely inundated. Although there was extensive settling of backfill along the sewer lines, no major breaks or serious clogging occurred, and sewage flowed freely to the treatment plant and to the flooded river. Two of the four oxidation ponds were washed out, and the treatment plant suffered some damage but continued to operate. Property losses of merchants were severe, and many homes in low areas along the creeks were flooded.

Floodwaters first seeped through the levee on the Mexican side of the Rio Grande at Piedras Negras into an old riverbed, trapping residents who had not heeded warnings to leave their homes. As the flood approached its crest, it overflowed the levee, and the trapped people

were forced to the roofs. There they huddled by lantern light to wait out the flood. During the night observers on the American side watched helplessly as the adobe homes melted and sank, and the floodwaters extinguished the lights one by one. Because many of these people were itinerant workers seeking entrance into the United States, the casualty list could never be definitely established.

On Wednesday, June 30, at 9:30 a.m. the Rio Grande reached a record crest of 61.35 feet at Laredo, 10 feet above the previous high mark on September 3, 1932. The International Boundary and Water Commission engineers anticipated a crest of 26 feet above the floor of the international bridge; it was 8 inches higher. Reports of the disasters at Acuña and Piedras Negras forced acceptance of the warnings at Laredo and Nuevo Laredo. The low areas along creeks in Laredo and the extensive low areas of Nuevo Laredo were evacuated. Consequently, no lives were lost in either city even though a large section of Nuevo Laredo was completely demolished by the rushing floodwaters.

Early in the evening of June 29 the raw water pumps at the Laredo water treatment plants became flooded and failed. The old plant, which had a capacity of 9 million gallons per day, was flooded and put completely out of commission.

The Laredo sewage treatment plant was completely submerged and had to be bypassed for a considerable time; but since the low areas along the creeks, which were mostly unsewered, comprised the major portion of the flooded area, there was no serious damage to the collection system.

Along the 250 or more miles of ravaged river course, many municipal water facilities were destroyed or inundated, and wells or other sources of supply were filled with filth-laden surface water. Sewage treatment plants and garbage disposal facilities were destroyed or severely damaged. Litter and silt covered the land, and putrescible material deposited with it was malodorous and provided limitless resources for the propagation of flies and other vermin. Mosquitoes multiplied rapidly because of the thousands of acres of residual water, and

they found easy access to the dispossessed human population.

Mobilization of Resources

On June 27, the day the flood crest first threatened residents of the border, the Texas Defense and Disaster Control Center at Austin was activated. This group, which was to become the operations nerve center of the disaster activities, was made up of representatives of the Texas State Departments of Health, Public Safety, Public Welfare, and Highways, Aeronautics Commission, Insurance Commission, Attorney General's office, and Railroad Commission; the State relations officer of the American Red Cross; a regional Public Health Service engineer; and the assistant regional director of the Federal Civil Defense Administration. The center immediately commenced mobilization of all resources for aid to the stricken and endangered areas.

The Communicable Disease Center of the Public Health Service was alerted Monday morning, June 28. Then or subsequently, arrangements were made for the assignment of two vector control specialists, 20 semiskilled laborers, 4 power-spray units, 20 hand-spray cans, 2 portable water treatment plants, 7 trucks, and a supply of insecticides and water treatment chemicals.

As the flood crest started downstream, there was no way of knowing the extent to which it might be supplemented by waters from northern Mexico; therefore, State and Federal personnel were alerted and material was readied for aid to the lower Rio Grande Valley should the Falcon Dam prove inadequate. The International Boundary and Water Commission opened the gates of the dam to maintain the river flow at half bank. When floodwaters began reaching the lake, the river below was allowed to flow bankful. Two and one-half million acre-feet of floodwaters was eventually held behind the dam with no damage to the lower valley.

On July 1 the flood was declared a major disaster under Public Law 875 (81st Cong.). Hence, responsibility for coordinating Federal assistance was assumed by the Federal Civil Defense Administration under authority of Executive Order 10427.

Ultimately, the governmental, voluntary, commercial, and individual forces of two nations equipped to deal with such disasters were gathered in this area to protect the health and welfare of the affected inhabitants.

Emergency Public Health Measures

Throughout the period from June 27 to July 8, the Texas Defense and Disaster Control Center maintained a constant check on the developing disaster and the needs created, using the mobile radio communications of the Texas State Department of Public Safety. Through joint action of the various participants the center located, procured, and dispatched to various points in the area technical personnel and essential supplies and equipment as they were needed.

Ozona

On June 30, when the flood crest was just reaching the Laredos, vector control operations were initiated in Ozona. At the request of the Ozona health officer, relayed to the Austin control center by an amateur radio operator, insecticides, power- and hand-spraying equipment, and vector control specialists from the State and the Public Health Service were sent to the town.

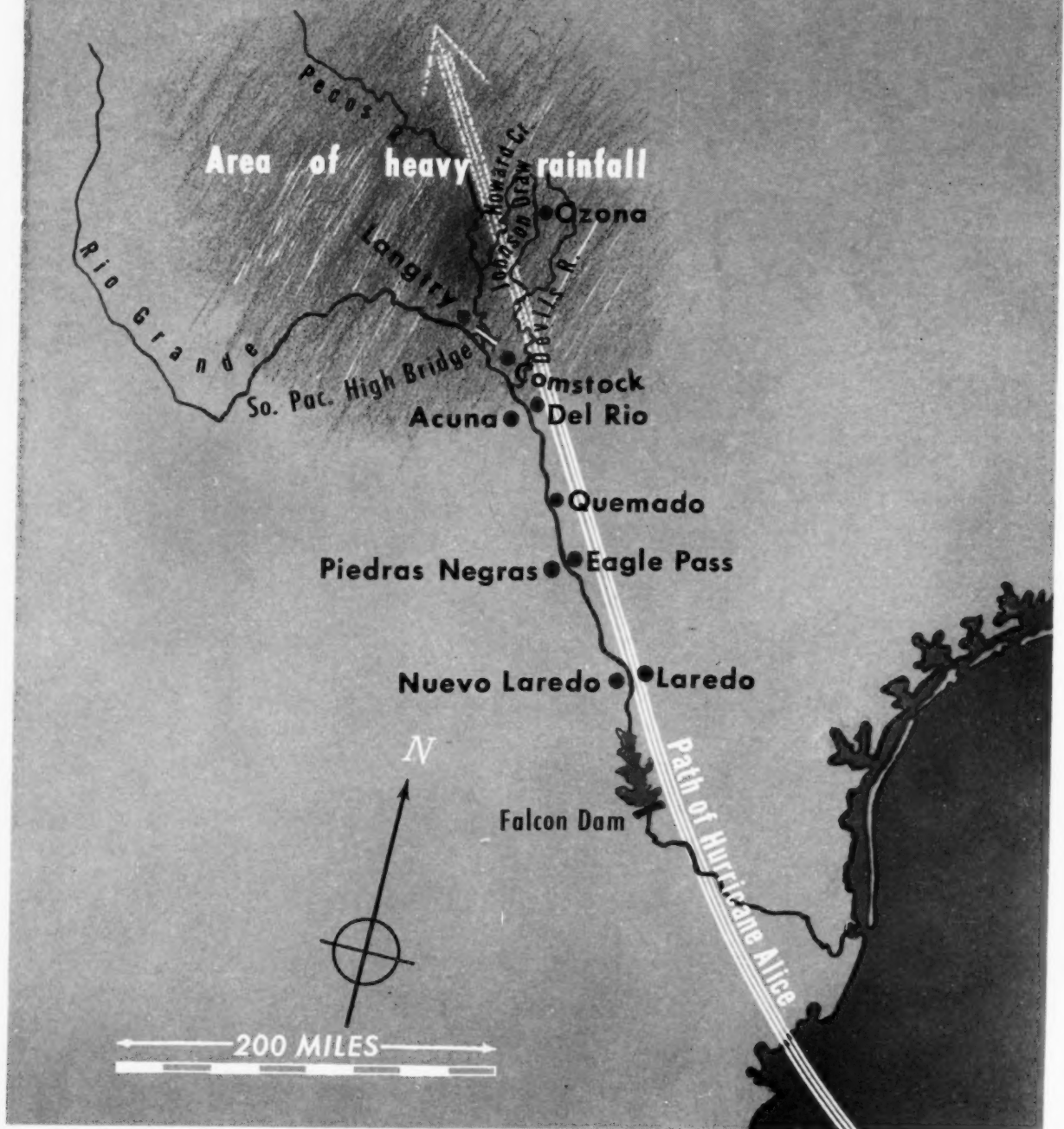
By Thursday, July 1, flies and mosquitoes were under control; an oil-DDT larvicide had been applied to all standing water; privy pits had been thoroughly treated with 3 percent gamma benzene hexachloride (BHC) dust; and the city had been space sprayed twice with a DDT emulsion using truck-mounted equipment. At the direction of CDC and State health personnel, many animal carcasses were removed to rendering plants. Those originally overlooked in the bushy areas of Johnson Draw were buried with bulldozers. Meanwhile, immunization clinics had been established, damaged food removed, and water and milk supplies checked for safety. All operations were turned over to local personnel on July 2, and State and Federal men and equipment were moved on down to the Rio Grande to bolster the crews already working downstream.

Comstock

Early in the flood crisis, normally quiet or dry streams throughout the area became raging

Rio Grande Valley

Area affected by flood of 1954





Eagle Pass

Nuevo Laredo



Laredo



Nuevo
Laredo

torrents, ripping out highway and railroad bridges and communications lines. Word was received at the State center that many motorists and 266 persons aboard a Southern Pacific train were stranded north of Comstock, Tex. The State relations officer of the American Red Cross arranged for the Red Cross to reimburse the military for the cost of evacuating stranded persons by helicopter to Comstock. All local Red Cross chapters in the flood area were alerted, and arrangements were made for medical personnel to be on hand to meet the rescued persons.

Del Rio and Acuña

Destruction of the approaches to the international bridge connecting Del Rio and Acuña cut off ground transportation between the two cities; contact was reestablished by helicopters obtained through arrangements with the military and the Red Cross. Until other help arrived, the people of Del Rio sent generous quantities of food, milk, and water to the stricken Mexican city. The Red Cross then furnished food, shelter, and field kitchens for the preparation of food. Insecticides were provided through public subscription by the citizens of Del Rio for treatment of the entire area.

By midnight of June 29, typhoid vaccine and drugs, water purification tablets, insecticides, insecticide-dispersing equipment and personnel, flushing equipment, and mobile water purification units were on the way to the remaining stricken and endangered areas along the river. By noon of July 1, immunization clinics and vector control operations were in full operation in those areas already passed by the flood crest.

Eagle Pass and Piedras Negras

Floodwaters at Eagle Pass, which had crested at 4 a.m. on June 29, subsided so quickly that it was possible to return to the water treatment plant 2½ hours later. There was no major damage to the plant building, and only the wash-water pump motors had been flooded. The raw water submersible pumps were not damaged. The equipment was checked, the filters and final sedimentation basin were disinfected with high-test calcium hypochlorite, and the plant was back in operation by noon. No major breaks in the water mains occurred, and

within the hour all sections of the city had adequate water pressure with free chlorine residuals in excess of 1 p.p.m. throughout the system.

State and CDC vector control personnel began operations in Eagle Pass on July 1 with three pieces of CDC automotive equipment, a power mist sprayer, hand-spraying equipment, and insecticides. Crews began the treatment of 900 privies in the city with 3 percent gamma BHC dust, and residual spraying of privy buildings and animal pens and larviciding of all residual water were started. Space spraying for the control of increasing mosquito populations was also commenced. Much organic material in the flooded area required immediate and regular treatment until it could be disposed of in a sanitary landfill.

At this time, mosquitoes were becoming a serious hazard in the Quemado Valley. Large areas here and in the Rio Grande riverbed adjacent to Eagle Pass were beyond the reach of either ground power equipment or hand-spray crews. Following authorization by the Maverick County judge, these areas were dusted by airplane with 10,000 pounds of 3 percent gamma BHC. With a CDC power sprayer, space sprays and larvicides were applied to mosquito-breeding areas in populated portions of the valley.

Also on July 1, helicopter service between Eagle Pass and Piedras Negras was established to carry food and medical supplies to the Mexican city. All available fire hoses from Eagle Pass and many adjacent communities and from Saltillo, 80 miles south of the Rio Grande, were gathered, joined together, laid across the remains of the international bridge and tapped into the Eagle Pass water system. Safe water was thus supplied to Piedras Negras until its water plant could be restored to operation.

Insects in Piedras Negras found favorable conditions for breeding. In one flour mill, for example, huge stacks of milled flour and 500 tons of wheat were soaked under 10 feet of water. The enormous increase in the fly population made control by insecticides impossible. Removal and burial of such material, a task of major proportions, thus became imperative. Even after this material was removed, many potential breeding places for mosquitoes and flies remained. In the first few days after the

flood, Piedras Negras and the adjacent area were dusted by airplane with 10,000 pounds of BHC. Materials and air service were contributed by the people of Eagle Pass and Maverick County.

On June 29 a request was made to the State control center for an improvised hospital for Piedras Negras. Through joint action within the center by representatives of the various agencies, all essential items were located, procured, and cleared for air transport within 3½ hours.

Laredo and Nuevo Laredo

As the flood progressed, it became apparent that Laredo would be the most severely affected of the communities in the United States. The Texas State Department of Health requested that an engineer from the Public Health Service regional office be sent to Laredo to assist in emergency sanitation and rehabilitation activities. As more complete information on the flood reached the Texas control center, the extent of vector problems at Laredo became predictable.

By the afternoon of July 2 the situation in the flood areas had become fairly stable; that is, existing problems were rather well known, and the amount of assistance that would be required throughout the river's course could be estimated. At this time, a board was established at Laredo for hearings under Public Law 875 to make available Federal financial aid for emergency repairs to public facilities damaged by the flood.

Reestablishment of an adequate supply of safe water was a pressing need in Laredo. High water prevented reactivation of the two treatment plants until July 1. In the meantime, since it was known that the raw water intakes were damaged, an emergency gasoline-engine-driven, skid-mounted pump with a capacity of 5 million gallons per day was obtained.

The old treatment plant in Laredo was severely damaged. Water had reached the second floor, and great quantities of silt, debris, and logs had entered the various buildings. Electrical wiring was ruined, chemical-feed machines were badly damaged, and the high-lift pump and motors and the electrical control panel were flooded. The area around the raw

water source had been washed away, and the 30-inch pipe header was broken.

The Laredo Waterworks System immediately contracted with a construction company to restore temporary service. Approximately 1 million gallons of water in the settling basins at the old plant were pumped to the main with the emergency pump. Drinking water was rationed to the public from a 1½-million-gallon supply of treated water which, through foresight on the part of the plant operators, had been stored in elevated tanks before the plant was inundated. Access roads to the plants and to the river had been washed out, but a supply of water was available from a lake at the edge of the city. Ten 1,000-gallon water tank trucks, supplied along with gravel trucks and bulldozers by the State highway department, transported water, after it was treated, to distribution points throughout the city. A sufficient supply of safe water was thus assured.

The road to the water treatment plants was repaired, and thousands of yards of gravel and dirt were used to build a road to the river. It finally became evident that the heavy deposit of silt would not provide a secure footing for the pump and that a floating mount would have to be obtained. For use as a temporary mount, a section of pontoons was provided by the United States Army Engineers, who were constructing a pontoon bridge for a temporary crossing in place of the washed-out international bridge. A temporary steel line was installed and connected to the undamaged section of the 30-inch line, and raw water was again available to the new treatment plant on July 4.

Throughout the emergency all water delivered to the distribution system had a chlorine residual of at least 10 p.p.m., and adequate residual was found to be available over the entire distribution system. By July 12 the motors of the low-lift stations and the pipe connections to the 30-inch line had been repaired, and an adequate raw water supply was available to the new plant. The rate of filtration was increased and about 7 million gallons per day was supplied to the city, which has a normal daily demand of 12 to 14 million gallons. Repairs to the old plant proceeded slowly as originally unforeseen difficulties were encountered.

A vector control specialist of the Communicable Disease Center was designated as the principal Public Health Service representative in the flood area for advising on insect control. The Laredo phase of insect control activities was begun on July 1, with the arrival of a power sprayer-duster and an emergency supply of chemicals from the Tyler, Tex., warehouse.

By July 3, hand-spray crews, using transportation provided by the city, were larviciding residual water and treating all organic material in the flooded areas. Dead fowl and animals were treated thoroughly, and the city garbage department was notified of their location. All carcasses were removed within a few hours after they were found.

Because of the initial interruption of service and the increased load, the city garbage department was unable to maintain a regular collection schedule, and flies multiplied rapidly. A jeep-mounted sprayer belonging to the Public Health Service was brought in from Eagle Pass on July 4 to supplement the State's mist sprayer. A round-the-clock schedule was set up for treating the city and a large mosquito-breeding area to the north with 5 percent DDT emulsion and 10 percent DDT dust. The mosquitoes were quickly conquered, and the fly population was reduced to a point well below normal in all sections of the city. The flooded areas of the city and the debris-laden riverbed were dusted with 3 percent BHC by an airplane provided by the United States Corps of Engineers. As insecticides became available, crews began dusting all of the city's 4,500 privy pits with 3 percent BHC and residual spraying all flooded buildings.

Since a large section of Nuevo Laredo had been completely demolished by the flood, the need for housing, food, and clothing was urgent. The Mexican Government immediately began construction of temporary housing for the displaced families, and food and clothing were provided by the American Red Cross. The insect problem, always a major one in this city, was intensified. Power-spraying equipment was offered the city, but a lack of trained personnel made its use impracticable. Hand equipment, insecticides, and technical supervision were supplied and put to use.

Postemergency Measures

As the board established on July 2 in Laredo to hear requests for Federal aid began to function, requests to the State control center in Austin dwindled, and on July 8 the center was closed. The Laredo board directed the planning of programs that were to continue long after the flood had passed. It approved Federal Civil Defense Administration projects in Crockett, Val Verde, Maverick, and Webb Counties, and in Eagle Pass and Laredo, costing approximately \$663,031, for emergency cleanup, insect and vector control, repairs to water and sewage facilities, repairs to streets, roads, and bridges, and emergency medical and other supplies.

Most operations after July 8 were extensions of the emergency activities and construction work in the repair or replacement of public and private facilities. On July 10 a temporary bridge was opened between Eagle Pass and Piedras Negras. On July 12 raw water was restored to the new treatment plant in Laredo. Until August 25, however, the two water purification units provided by CDC continued to furnish emergency drinking water supplies in the Quemado Valley.

On July 19, CDC hired 7 inspector-foremen and 9 laborers to extend the vector control work at Laredo, and a long-term sanitary improvement project was begun in that city.

Throughout the critical period, immunization clinics operated quietly and efficiently. Sixty-eight thousand of the 100,000 residents of the disaster area of Mexico and 62,000 of the 80,000 Texans were immunized against typhoid fever. Vaccine for both Americans and Mexicans was furnished by the Texas State Department of Health and the Fourth Army Headquarters.

No outbreaks of dysentery or diarrhea were observed. In fact, the incidence of these diseases appeared to be below normal, probably as a result of better diets, sanitary food storage and preparation by the Red Cross, safe drinking water, and the control of insects. Not one case of communicable disease which could be charged directly to the flood was reported on either side of the border.

During this disaster, many individuals and

organizations contributed equipment, money, and services to add to the total relief activity. Usually such action is unrecorded. However, one instance of such assistance can be reported here. During the July 4 weekend, the need for insecticides in the Laredo area had become critical. Material had been delivered as far as San Antonio, but it was delayed there awaiting Government transportation to the disaster area. A San Antonio, Tex., truckline operator donated the services of a truck and driver to rush 8,500 pounds of the badly needed chemicals to Laredo.

By September 3 nearly all emergency work was finished and another disaster had become history.

Lessons From the Experience

A natural disaster such as the Rio Grande flood of 1954 demands immediate and force-

ful action to save lives, protect property, and minimize suffering. From a critical review of the problems encountered and the action taken, one lesson stands out clearly: The prompt activation of a disaster control center in which representatives of all local, State, and Federal agencies concerned serve cooperatively under a central authority to observe the developments and trends of the catastrophe, evaluate the problems, plan the emergency action, and initiate relief measures is of inestimable value. An operational headquarters at the site of the disaster as an extension of the disaster control center would insure maximum efficiency by minimizing duplications of actions and misunderstandings.

Development of the framework for a disaster control center in each State and Territory would be an excellent step forward. Collectively, such centers would constitute a valuable national resource in disaster aid.

technique

Community Nursing Service

An experiment in community nursing conducted for more than 2 years in school district 4, Spartanburg County, S. C., combines school nursing with nursing care of the sick and other aspects of public health nursing.

The program was initiated in response to a recommendation made in 1951 by Dr. Carl Buck that the nursing services of the county health department and the Visiting Nurse Association be integrated. Carried out by two nurses, Miss Marjorie Cannon and Mrs. DeVieux Campbell, under the supervision of the county supervisor of nurses, Miss Evelyn Johnson, the combined service was directed by Dr. J. C. Hedden, the county health officer.

According to Sam C. Brissie, district 4 school superintendent, setting

up the program in trial demonstration form has allowed improvisation and close adaptation to the needs of the community, a textile region with both urban and rural components in a population of about 12,500.

Scheduled visits to the 8 elementary and 3 high schools provide teachers with the opportunity to consult the nurses on problems arising with the students or in homes represented in their classes. Repeated visits by the same nurses to the same families, whether to see the school child or another family member, enable the schools to maintain continual contact with homes where health problems interfere with the children's education. Through personal contact, the nurses have been able to recognize other home problems and refer them to the proper agencies. As representatives of the school or of the nursing service, they work with such welfare organiza-

tions as the Woodruff Exchange Club, from which they obtained eyeglasses for needy children. They have also worked closely with the tuberculosis association in planning and carrying out an X-ray survey.

In the school instruction program, the nurses show films and teach home and disaster nursing to home economics classes. All schools have been provided with standardized first aid supplies and charts showing how and when each item is to be used.

Brissie feels that the combined nursing service represents a greater contribution to this community than the work of many school nurses who remain all day in one building waiting for an accident to happen. Of all the types of nursing programs possible for the district, it comes the closest to fulfilling the total needs of the community for nursing services, he stated.

We have the same climate; we have the same soil; we have the same people; and we have the same diseases. The international boundary does not stop the crossing of germs, and the only answer to our public health problems is the one we work out together.—Governor Maldonado of Baja California.



CONFERENCE REPORT

The cooperative flow of ideas and information across the border continues through the medium of the United States-Mexico Border Public Health Association. This year, at its 15th annual meeting in San Antonio, Tex., April 9 to 12, public health officials examined joint health projects and problems as yet unchallenged. Pervading the discussions was the theme of perfecting and expanding health techniques.

Meeting the Challenge Through Border Programs

In his address as president of the United States-Mexico Border Public Health Association, Dr. Guillermo M. Soberanes urged renewed efforts in border health programs, particularly those of environmental sanitation. A personal visit in 1956 through the region convinced him that progress does not hinge solely on Federal or State aid; participation must be enlisted in the local communities directly affected.

Soberanes, who is chief, Coordinated Services of Health and Welfare, Hermosillo, Sonora, Mexico,

commended the States of California and Baja California for their smooth collaboration, which, he felt, ought to be extended along the border. He advocated daily meetings and frequent interchange of discussion instead of at annual conferences only. Local health authorities must know more about the objectives of the association and must be stimulated to take part in all activities and given facilities to attend the annual meetings, he said.

During the past year the association concentrated on translating earlier recommendations and agreements into action. For example, the direct exchange of information on venereal disease contacts between

local health departments on both sides of the border was put into effect through the use of specially designed forms, a significant step in venereal disease control, he said. Also, health departments set up an effective system for transmitting weekly communicable disease reports across the border. The bi-state and tri-state meetings to discuss public health problems he described as the most practical medium for the exchange of information.

For mosquito control on the Mexico-Texas border, international, Federal, State, and local health agencies collaborated in entomological surveys. In June 1956 a survey of mosquito vectors was carried out

throughout the lower Rio Grande Valley from Brownsville-Matamoros to El Paso-Ciudad Juarez.

Realization of the border survey of health problems and resources was brought nearer by the Mexican Ministry of Health and Welfare, which expressed its interest in such a survey to the Pan American Sanitary Bureau. This step, supported by a similar move by the United States, permits immediate planning.

In conclusion, Soberanes pointed out that if the association is to continue toward its objectives, it must achieve a sound financial and administrative structure.

Sanitation Standards For Tourist Facilities

The fact that travelers are especially vulnerable to health hazards from deficient sanitation has stimulated action by a number of organizations, culminating in the preparation of minimum sanitation standards for tourist facilities.

Briefly sketching the background for these steps, George O. Pierce, chief, environmental sanitation branch, Pan American Sanitary Bureau (regional office for the Americas of the World Health Organization), outlined current, independent efforts of travel agencies and hotel associations to protect their patrons. He remarked that criteria used by these groups in inspecting and grading tourist accommodations are often, although not always, based on the knowledge and experience of public health workers. Heightened interest of countries in the Western Hemisphere in improved sanitation for travel centers reflects the possible damage to tourist revenues when potential visitors are exposed to the risk of disease.

Momentum for action taken by the Pan American Sanitary Bureau came from the Inter-American Travel Congress. In accordance with an official request from the congress in 1946, the Bureau appointed an eight-member committee to prepare a set of minimum sanitation standards applicable to tourist accommodations. In drawing up the manual, the committee will consult public

health authorities in countries with special interest in tourist traffic.

Another manual is under preparation by the Joint International Civil Aviation Organization-World Health Organization Expert Committee on the Hygiene and Sanitation of Airports. This committee Pierce described as an outgrowth of the sixth meeting of a special committee on international sanitary regulations, set up by the Third World Health Assembly in 1950, during which attention was drawn to the embarrassment and delays to commercial aviation from insanitary conditions. Activities of both the ICAO-WHO and the PASB committees will be coordinated.

He pointed out that, although the basic principles of sanitation are universally applicable, the degree of protection needed and suitable or available means of providing it vary from place to place. With this in mind, the committees are developing guides of practical value to public health officials and organizations interested in tourism.

Training Voluntary Aides In Rural Mexico

The program to train auxiliary rural health workers in Comarca Lagunera, Coahuila, was outlined by Gudelia Hernandez, Cooperative Rural Medical Service, Ministry of Health and Welfare, Mexico. She described this educational effort as a vital preliminary to the participation of rural areas in the government's overall health program.

Training is conducted by the Cooperative Rural Medical Service whose responsibilities are medical treatment assistance, medical sanitary methods, maternal and child welfare assistance, environmental sanitation, and social organization of the community. To achieve its objectives, the service offers permanent inservice training and technical aid and supervision.

Community leaders and officials recruit voluntary aides, chosen on the basis of personality and character. Recruits are between 15 and 20 years of age. The teaching staff, including a physician, a public

health instructor, two economists, and a physical training instructor, give courses in first aid, home cleanliness and distribution of living space, cooking, nutrition, organization and hygiene of the kitchen, sewing, basketmaking, and repair of discarded utensils.

Trainees study from 9 a. m. to 2 p. m. 3 days a week for 6 months and take examinations every 2 months. The course concludes with an exhibit and the award of a ring and diploma to each graduate.

Mexico Systematizes Public Health Training

Mexico's expanding health programs are bolstered by the systematic, step-by-step training of public health workers described by Dr. Felipe Garcia Sánchez, director, division of coordinated state health services, Ministry of Health and Welfare, Mexico.

New workers, after observing public health programs in action at demonstration centers, spend 75 days at training centers to learn theory and practice. After inservice training at health centers, they proceed to regular courses at the School of Public Health. Engineers are sent to the Postgraduate School of Sanitary Engineering of the National University of Mexico. Fellowships for observation in public health in other countries are available to appointees with master of public health degrees.

Forty-five health centers scheduled for construction will be used as training centers, he said, providing additional facilities for the program. Trainees now number 1,642.

Inservice Training Course For Public Health Nurses

To meet the shortage of public health nurses in the border States, an inservice training program has been set in motion by the Mexican Ministry of Health and Welfare. According to Esperanza Sosa Vazquez, public health nurse with the division of nursing and social work in the Ministry, nursing schools in

the region do not offer public health courses to the relatively few students enrolled.

The inservice education program is planned and applied by the chief nurse of the local health center. Key administrative and technical personnel in each center help to model the nursing service.

The course emphasizes the educational role of the public health nurse in relation to the services offered by the center. Often these services include maternal and child hygiene, control of communicable diseases, physiotherapy, mental hygiene, and dental hygiene. Further training prepares the nurse for work in mothers' clubs. Each club, Sosa Vazquez explained, meets with a nurse and social worker.

Safety and Sanitation Before Horticulture

Dry weather during the last 7 years in Texas has turned many rural and small-town families to essential homestead improvements, which in years of normal rainfall would have been neglected in favor of planting shrubs and rosebushes.

In a description of the 1956 drive for sanitation and safety at home, Sadie Hatfield, extension specialist in homestead improvement, Texas Agricultural and Mechanical College, reported that through demonstrations by trained agents the safety of 4,213 homes had been enhanced. Trash burners were added, water wells tested and made safe, drainage areas eliminated, and septic tanks installed. Setting up recreation equipment, walks, and drives were other dry-weather improvements.

Hatfield trained a core of 296 home demonstration and some county agricultural agents to help make rural homes more comfortable, convenient, and beautiful. For mass results in vast Texas, the staff was augmented by trained local club leaders and "result demonstrators," families who had already improved home grounds according to recognized standards.

Agents, demonstrators, and lead-

ers were trained in large workshops in cooperation with other specialists, college faculty members, and employees of the Texas State Department of Health, and other government agencies, and business firms. The result, she said, was that 1,440 leaders gave method demonstrations to 23,267 people. They taught families how to root shrubs and trees from cuttings and seed, transplant trees and shrubs, take water samples for testing drinking water, build safe trash burners and good clotheslines, make flowerbeds, and conserve soil and water.

In another phase of extension work, the 4-H shrub identification contest for youngsters 9 to 20 years old was conducted at county and district levels and finally at the State level. Points were given for answers on shrubs and trees and their correct uses on home grounds, for pictures of homesteads with safety and sanitation improvements, and for written compositions on protecting water supplies and on waterborne diseases.

The Texas Forest Service supplied low-cost windbreak trees for western areas. In 1956, mostly in irrigated lands, 689 were planted. Hatfield explained that windbreaks lessen dust as well as wind. She reported that 750 families made homestead improvements.

Border Diarrhea Decline Less Than National Rate

Lives lost to diarrheal disease in the four Mexican States bordering the United States formed a slightly larger proportion of the total for Mexico in 1954 than in 1945. Dr. Carlos Ortiz Mariotte, Department of Epidemiology and Special Health Programs, Mexican Ministry of Health and Welfare, compared the 42-percent nationwide reduction during the 10-year period with 48 percent for the border States, and, in the infant group, a 66 percent drop nationally with 64 percent on the border. In diarrheal disease, he grouped dysentery, gastritis, duodenitis, gastroenteritis, colitis, enteritis, and diarrhea of the newborn.

Combined figures for the decade 1945-54 show 102,000 diarrhea-caused deaths for Mexico, of which 26,600, or 26 percent, were in the border States. Sixty percent of the national total were infants compared with 72 percent for the infant component in such deaths on the border.

In 1954, 65 percent of the diarrheal disease deaths in the 4 States were in infants, while 50 percent was the comparable figure for Mexico as a whole.

Pioneering Techniques In Bracero Survey

A mass blood-testing campaign ushered in a syphilis case-finding survey of Mexican farm workers, or *braceros*, entering the United States in the late summer and early fall of 1956. Piloted by the Public Health Service, the survey was a model of effective cooperation between private enterprise and public health workers.

Survey techniques and findings were described by two officials of the Public Health Service, Dr. William J. Brown, chief, Venereal Disease Branch, Communicable Disease Center, Atlanta, Ga., and Dr. Johannes Stuart, program management officer, Washington, D. C.

From August 16 through October 12, 115,506 *braceros* were blood-tested as they passed through reception centers at El Paso, Tex., and El Centro, Calif., at the rate of 400 an hour. Clerical tasks were cut to a minimum by mimeographing identification cards bearing blood sample tube numbers and workers' destinations.

Of the 9,240 positives 6,788, or 74 percent, were found for diagnosis and treated while they were still in the United States. Those entering by way of El Paso were located by health department investigators of the States receiving them, and, for the most part, treated in public clinics. In California an insurance company providing medical care for *braceros* volunteered to locate seropositive men, with help from growers' associations and farmers, and to supply diagnosis and treat-

ment. This free assistance and economies from the size of the operation more than offset high travel and maintenance costs for personnel, transforming the survey into one of the most economical of its kind.

The next stage consisted in notifying the appropriate State health departments in Mexico of positive reactors who were missed. The new Pan American Sanitary Bureau form was used for this purpose, as it was for reporting on wife contacts. Gleaned from U. S. Department of Labor files, names and addresses of the wives were sent to Mexican health departments with the request for notification on the results of investigations.

Of the total contact notices sent, reports on 6.8 percent were returned. Certain Mexican states completed almost all the forms; others none at all. The variation in response points to the need for clarifying use of the forms in some areas in Mexico and for care in transcribing addresses on the cards in the United States.

Prophylactic Penicillin Study

Dr. Mariano Curiel Alcala, chief of the Institute of Social Hygiene at Mexicali, reported on a clinical study of 500 women exposed to the risk of venereal infection. The study demonstrated conclusively, he said, that routine weekly injections of 300,000 units of procaine penicillin in oil with aluminum monostearate prevents gonococcal infection. Extensive use of this procedure in certain Mexican cities, he said, is a major factor in inhibiting the transmission of venereal disease.

Bacillary Dysentery High in Texas

About 50 percent of the bacillary dysentery cases in the United States during 1956 occurred in Texas, according to Drs. J. E. Peavy, J. V. Irons, and W. D. Carroll, of the Texas State Department of Health. Also reported from the State were 16 percent of all cases of salmonellosis. While the estimated 159 cases of typhoid fever last year are a

sharp drop from the 443 reported in 1946, and the 918 cases in 1936, the 1956 figure constitutes a tenth of typhoid fever reports in the Nation.

They pointed out that the actual incidence of diarrheal disease is difficult to determine, since most cases, except those of typhoid fever, are not reported to authorities unless a marked increase prompts epidemiological investigation.

Group C *Salmonella*, including *S. oranienburg* and *S. newport*, were dominant among the 231 cultures of this genus identified in 1956 by public health laboratories and among the 48 cultures grown up to April 1957. Some of these organisms were frequently found in eggs. From January 1956 to March 1957, *Salmonella reading*, epidemiologically important in certain areas, was encountered only 3 times.

During this interval, *Shigella flexneri* was found 83 times; *Shigella sonnei* was cultured 13 times, and *Shigella boydii*, twice. Of the 12 cultures of *Shigella-Salmonella* from diarrheal disorders in the United States-Mexico border counties, 10 were found at Laredo or El Paso. A special study was conducted at Laredo during 1956-57.

Urges Renewed Effort For VD Control

Dr. Antonio Campos Salas, director, National Campaign Against Venereal Disease, Ministry of Health and Welfare, Mexico, cited official estimates for Mexico showing that more than 300,000 persons have syphilis and that 2,000 die annually from the disease. For gonorrhea the estimated number infected is about five times greater than for syphilis.

A series of serologic tests on large population groups revealed positive results among 4 to 8 percent of women given official prenatal services. Rates for laborers were 6 to 25 percent; farmers, 6 to 12 percent; military personnel, 11 percent; policemen, 10 to 25 percent; government employees, 5 to 12 percent; students and adolescents, 1 to 3 percent; and food handlers, 4 to 10 percent.

Intensive education of the public is part of the government program described by Campos Salas. Other features of the program are prophylactic treatment with delayed action penicillin and a move to coordinate efforts by physicians.

Case-Finding Skills Key to U. S. Program

Today 85 percent of all syphilis contacts in the United States are brought to examination, stated Warren T. Davis, health program representative of the Communicable Disease Center, Public Health Service, in Atlanta, Ga., in a review of the national venereal disease control program.

Groundwork for the first intensive case-finding campaign began in 1946, when the Public Health Service received requests from many States for workers skilled in interviewing for sex contacts, statistical analysis of data, and planning and conducting field studies. By 1949, training programs were set up in a number of States, as well as several with Federal cooperation.

Both civilian and military epidemiologists have traveled to these schools at Federal expense for clinical experience and interviewing and investigation under skilled guidance. The schools are pioneering the use of electronic devices for training purposes. A mobile training school also carries specialized training to staff members in venereal disease clinics across the country.

Techniques developed for interviewing patients reflect the fact that contracting a venereal disease is in itself a traumatic experience. The associated pattern of guilt, fear, and distrust in most patients calls for methods that create trust so that the patient names sex contacts and provides information sufficient to bring them to examination.

Monthly reports from workers in the field are used to evaluate activities and results. Control reports, dealing with morbidity, epidemiology, and special projects guide statisticians in advising administrators on current incidence. The statistical unit also publishes quarterly

Syphilis Morbidity Rises

Venereal disease continues to be a major public health problem in the United States. This is evidenced by the fact that in 1956, for the first time in 8 years, the total number of syphilis cases reported in the United States, 126,000, was larger than the previous year's total, which was 122,000. During this period, infectious syphilis cases also increased in 18 States and in the Nation as a whole. It is estimated that almost 2 million Americans are currently in need of treatment for syphilis. During 1955, the last year for which we have data, 1,700 persons were admitted to mental hospitals with syphilitic psychoses.

—DR. WILLIAM J. BROWN, chief, Venereal Disease Branch, Communicable Disease Center, Public Health Service.

statistical letters and an annual venereal disease fact sheet.

Davis illustrated how the constant pooling of therapy evaluation data by Federal health workers directly influences the program. Once the slow, absorptive forms of penicillin had been evaluated through therapy evaluation studies, the whole venereal disease control program was quick to shift from inpatient care at rapid treatment centers to clinical outpatient therapy.

A national program of serologic evaluation, he concluded, has led to gradual improvement in specificity, sensitivity, and reproducibility of standard serologic tests in public health laboratories.

Treponemal Antigen Production

Research in growing *Treponema pallidum* through new tissue culture techniques conducted at the Venereal Disease Experimental Laboratory, Communicable Disease Center, Chapel Hill, N. C., was described by Dr. Clarence A. Smith, deputy chief of the Communicable Disease Center. He also reported that the *Treponema pallidum* complement fixation test using a treponemal antigen has proved to be a practical diagnostic procedure for syphilis. Two firms are producing the antigen for commercial use. A parallel project at the CDC laboratory is directed toward producing an immunizing vaccine for syphilis.

Reporting on the program for finding and treating migrant farm workers with syphilis during the last half of 1955, he stated that 4,620

(13.2 percent) of the 35,000 tested were positive reactors and received penicillin treatment.

Antimalarial Progress In Mexico

An account of Mexico's full-scale campaign against malaria presented by Dr. Manuel E. Pesqueira, vice minister of health and welfare, brought out that about 2 million persons have malaria and about 5,000 die yearly of that disease in Mexico.

Reviewing achievements of the National Commission for Malaria Eradication, Pesqueira stated that a corps of 4,701 workers were trained during 1956 for full-time epidemiological work and spraying operations. The geographic frontiers of malarious areas, covering 61,594 localities, and the periods of seasonal transmission were determined, and with the close cooperation of private physicians blood samples were taken from 61,503 malaria suspects for parasitological examination.

Studies on *Anopheles pseudopunctipennis pseudopunctipennis*, *Anopheles albimanus*, and *Anopheles aztecus* in 65 localities demonstrated their great susceptibility to DDT in Mexico. Other studies in the State of Chiapas and in the chicle and woodworking camps in the Yucatan jungles are being conducted to determine whether spraying alone will provide protection against malaria.

A broad and methodical spraying operation opened with a geographic

reconnaissance of the malarious area, which was divided into 14 zones. In addition to recording the location of each house and the way to reach it, the study covered such features as the quality of the walls and surfaces to be sprayed. Within 6 months, maps were completed for 58 percent of the country and heliographic copies printed of localities, which for the most part represented spraying units.

Each house on every map was assigned a number. To ascertain individual output per sprayman, initial spraying was carried out in the fall of 1956, covering 452,904 houses. This operation illustrated that the average work potential per sprayman was nine houses in a day, varying according to motorized, mounted, or water brigade. On this basis, definitive spraying operations began in January 1957 with a target of 5½ million sprayings by the end of the year, enough to provide complete protection for inhabitants in malarious regions.

Pesqueira continued with a description of the public education phase of the program. Audiovisual units, he said, carry to each community the educational message it needs. Material includes pamphlets translated into 15 regional languages. Another feature of the education drive is enlisting the active participation of key people in the zones, who receive the title of "honorary aides of health education."

Parallel activities in research deal with susceptibility tests on insects and the breeding conditions and habits of anophelines. Pesqueira reported further that tests on insecticides are measuring their organoleptic features and other specifications. Lethal effects in situ are under study as are the effects of anti-malarial drugs.

Logistical plans encompass all data covering cartography, transportation, and evacuation. The main function of logistical personnel is to supply insecticides and equipment so that zone projects proceed on schedule. They also supervise and maintain 633 vehicles. For this purpose, zones are equipped with permanent and mobile workshops.

Yellow Fever Measures In the United States

ROBERT J. ANDERSON, M.D.

SINCE the last outbreak of yellow fever in the United States more than 50 years ago, only occasional cases have been reported, all contracted outside this country. The last incident of urban transmission occurred in 1906. No cases have been reported since 1924.

Yellow fever is not indigenous to the United States. It was introduced to the region in the 17th century, causing frequent devastating epidemics for more than 200 years. In fact, an epidemic of yellow fever stimulated the establishment of one of our State health departments in 1855. After aggressive measures cleared up the problem a half century ago, urban yellow fever has remained under control through a combination of quarantine measures and improved sanitation.

Our natural environment favors us to some extent with regard to jungle yellow fever; although a mosquito vector, *Haemagogus*, is known to be present in one area of the United States, the monkey host is not native to our country.

We are fully aware, however, that yellow fever cannot be disregarded as a potential hazard. Modern means of transportation make it possible for a person to acquire yellow fever in an endemic area and to reach the United States within the incubation period of the disease. Against this eventuality we are continually on guard.

Precautionary Measures

Medical officers of the Division of Foreign Quarantine, Public Health Service, examine travelers to the United States who show signs

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of illness which might be yellow fever. Precautions are also taken to prevent the importation of infected animals. Pursuant to the International Sanitary Regulations of the World Health Organization, the division carries on a program of mosquito control and surveillance on carriers and around international airports and piers of seaports, as well as at border crossing points in receptive areas.

As a further safeguard against the free travel of insect vectors from one country to another, our foreign quarantine regulations require that airplanes, ships, and certain other vehicles on international routes be treated with insecticides. Technologists of the Communicable Disease Center are engaged in studies to improve such insect control measures.

A very important measure in the international control of yellow fever is vaccination. According to our foreign quarantine regulations, vaccination is required for persons leaving an infected area and proceeding to the United States. The United States recommends vaccination for travelers to all areas where exposure to yellow fever is a possibility. The Division of Foreign Quarantine is responsible for yellow fever vaccination centers in this country.

In addition, the Public Health Service keeps watch on *Aedes aegypti* mosquitoes in the portion of this country where they are known to be present, roughly, the area south of a line drawn from southern Virginia westward through northern Oklahoma and then southwestward to El Paso, Tex. During the Second World War, anti-*aegypti* campaigns were held in several cities in this area, principally in ports of entry. Data from a survey made in 1952 of 16 of these cities and 12 others in the *aegypti* area indicated a marked lessening of the *aegypti* population. Another survey made by the Communicable Disease Center in 1956 indicated a continued downward trend. General sanitation programs, which have eliminated breeding places, and increasingly common use of insecticides, as well as campaigns against mosquitoes generally, have contributed to reducing the density of this species.

Study Projects

Under conditions prevailing through most of the past 50 years, current precautions would

probably suffice. Recent changes in the international picture of yellow fever, however, call for sharpened alertness. Jungle yellow fever has been found in many places in South and Central America, and a number of human cases have been reported in these areas in the past 10 years. In the light of these circumstances, we now have under way projects which will put us in a more favorable position to deal with new yellow fever problems if they arise. Surveys now being made in the historic yellow fever receptive areas, to determine the distribution and density of *A. aegypti*, will provide data for more accurate definition of the present problem area.

Because extensive programs to eradicate the *A. aegypti* mosquito specifically have not been attempted in the United States—only one city has been covered by an *aegypti* eradication campaign—we do not know if such programs are practical in our country. We have no way of determining whether methods successful in other countries are applicable here. We therefore hope to conduct a demonstration eradication project in a representative city in the *A. aegypti* zone. This includes inspection of premises, elimination of breeding places, and the application of insecticides; repeat visits will be made—with decreasing frequency as the area under control is extended and as areas remain free of *aegypti* mosquitoes.

While we have had no reports of yellow fever in the United States, it is possible that the disease has been present in a mild form that has escaped notice. The experience in Trinidad in 1953, when serologic tests indicated that yellow fever had occurred unnoticed 20 years previously, emphasizes this possibility. As a part of its surveillance program, the Communicable Disease Center is planning serologic surveys in areas where importation and transmis-

sion of yellow fever have been most likely in order to provide some estimate of exposure experience.

Studies at the Communicable Disease Center on the susceptibility of indigenous mosquito species to infection and their ability to transmit the virus will add to our ability to evaluate the likelihood of yellow fever transmission under both rural and urban conditions. Work is going forward in the Communicable Disease Center laboratory toward developing rapid diagnostic methods for yellow fever and other tropical virus diseases in which a number of relatively new techniques, such as tissue culture, are being explored.

Other Public Health Service research plans for overall studies of arthropod-borne viruses are now in the formative stage at the National Institutes of Health. These studies will be carried on at a basic laboratory in Bethesda, Md., in the Laboratory of Tropical Diseases, and at a field laboratory in the Canal Zone under the joint auspices of the Institutes and the Department of Defense. They will supplement the distinguished work of the Gorgas Memorial Laboratory in this field. As presently planned, the new project will have a permanent staff in the Canal Zone, and will provide space for visiting groups working on problems of mutual interest. Preliminary work is under way in Guatemala, where a staff member from the Laboratory of Tropical Diseases was assigned for liaison between the laboratory in the Canal Zone and field activities in Guatemala. Also involved in the work in Guatemala will be the Pan American Sanitary Bureau and the Gorgas Memorial Laboratory.

This work will help to preserve and improve professional competency in recognizing yellow fever in animals, diagnosing it in humans, and controlling the insect vectors responsible for its transmission.

Long-Time Trends in Illness and Medical Care

THIS STUDY is devoted largely to several indexes of illness, medical care and mortality in various population groups. Trends of mortality in the civilian population are shown by age, for all causes, and by important causes, for all ages.

Comparisons of urban and rural residents with respect to illness, hospital care in short-term hospitals, and also in long-term mental and tuberculosis hospitals, are made for certain places. In war and postwar periods, Federal hospitals carry a considerable load of care of men in the armed forces and veterans of those forces.

Data are shown for (a) relative age variation of illness for many specific acute and chronic diseases and (b) relative seasonal variation of illness from disease groups and specific diseases. For the chronic diseases, these age and seasonal variations are shown in terms of acute exacerbations or attacks of the disease.

Mortality from disease and accident (exclusive of battle casualties) in the armed forces during the past century follows the same general trend as mortality among civilian males of comparable ages. Obviously, mortality rates for civilians of all ages would be higher than for the armed forces, because the great majority of those forces are young men of the healthy ages, who have been carefully examined for disease, physical impairments, and mental and neurological abnormalities before being taken into the services. However, mortality rates from disease only, exclusive of all accidents and battle casualties, are higher among civilians of comparable ages than among the armed forces, presumably because the diseased and the impaired are rejected in the entrance physical examinations.

Life expectancy at birth in the United States

has increased in the last half-century from 49 to 69 years, an addition of 20 years to the average life expectancy. Another figure of equal interest which can be obtained from life tables is the proportion of persons in a cohort of 100,-



Public Health MONOGRAPH

No. 48

The accompanying summary covers the principal findings presented in Public Health Monograph No. 48, published concurrently with this issue of Public Health Reports. The author is with the Division of Public Health Methods, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Collins, Selwyn D.: A review and study of illness and medical care, with special reference to long-time trends. Public Health Monograph No. 48 (Public Health Service Publication No. 544). 86 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1957.

000, that is, persons who are assumed for purposes of computation to have been born alive at the same instant of time, who are still living at different ages. For example, according to the life table based on 1953 mortality, 97 percent of these infants would be alive at the end of their first year, but only 87 percent according to the 1900-1902 (1901) table; at 50 years of age, 89 percent would still be alive according to the 1953 table, compared with 59 percent by the 1901 table; and at 85 years, 17 percent would be alive by the 1953 table, but only 6 percent by the 1901 table. Thus, at approximately present mortality rates, nearly three times as many people will reach 85 years of age than would reach that age at death rates of 50 years ago.

First admission rates per 1,000 population to State mental hospitals in New York have increased since 1900 in about the same proportion as heart disease death rates in the total United States. Compared with the increase in heart diseases, noninfectious disease mortality exclu-

sive of heart diseases has increased only gradually.

Of 7 major causes of first admissions to State mental hospitals in New York, 5 have increased considerably since 1925, but the other 2 have decreased markedly. Of the same 7 diagnoses, 3 are higher for women than for men (senile, manic-depressive, and involutional psychoses). First admission rates for alcoholic psychosis and general paresis are much higher for men than for women, and cerebral arteriosclerosis rates are somewhat higher for men. Schizophrenia rates were slightly higher for men up to about 1950, but the reverse is true for the years since that time.

First admissions of epileptics to institutions for their care in New York State decreased from 2.5 to 1.4 per 100,000 population, or 44 percent, in the 18 years from 1933 to 1951; but first admission rates of mental defectives decreased only from 9.1 in 1930 to 7.9 per 100,000 in 1951, or only 13 percent.

Traineeships in the Rehabilitation of the Blind

A limited number of traineeships in rehabilitation of the blind are offered by the Industrial Home for the Blind, Brooklyn, New York. Each traineeship amounts to \$50 per week. There is no tuition fee.

The training program, developed by the Industrial Home for the Blind in cooperation with the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, combines academic and field experience into 20-week and 40-week courses for the preparation of vocational counselors and other vocational specialists serving the blind.

In order to qualify for traineeships, applicants must have a bachelor's degree from a recognized university or the equivalent in training and experience. They must have a clear vocational goal in work for the blind as well as emotional stability and personal readiness for professional training. Blind applicants are expected to have mastered the essential tools of learning without sight—self-travel, typing, braille, and the use of recording equipment.

Application blanks and further information may be obtained by writing to Dr. Herbert Rusalem, Director of Professional Training, Industrial Home for the Blind, 57 Willoughby Street, Brooklyn 1, New York.

Mortality from Snakebites, United States, 1950-54

HENRY M. PARRISH, M.D., M.P.H.

POISONOUS snakebites in the United States are by no means rare. However, few studies indicate the incidence of poisonous snakebites in a given region or State, and no studies give the actual death rate in this country resulting from poisonous snakebites alone.

The estimate by Githens, quoted by Porges (1) and others, of 2,000 to 3,000 snakebite accidents a year in the United States is based on such sources as news clippings and is possibly far too low.

Swaroop and Grab (2) pointed out the importance of snake venom poisoning throughout the world. They estimated that 30,000 to 40,000 deaths occur annually from this cause. The same authors estimated that there are from 10 to 20 deaths from snakebites in this country each year.

One of the major difficulties in a study of snakebite deaths is that the International Statistical Classification of Diseases, Injuries, and Causes of Death classifies snakebites under E927 with "accidents caused by bites and stings of venomous animals and insects." Included in this classification are the bites or stings of centipedes, scorpions, bees, wasps, snakes, and other venomous animals. The purpose of this study is to determine the death rate from poisonous snakebites in the various States, to discover what kinds of snakes cause most of the fatal bites, and to study other pertinent medical facts related to these deaths.

Two families of poisonous snakes inhabit the United States: the Crotalidae, or pit vipers, and the Elapidae, or coral snakes. Of the pit vipers, the genera found in this country are the

Crotalus, or rattlesnakes, the *Agkistrodon*, or moccasins (including the water, or cottonmouth, moccasin, and the copperhead, or highland, moccasin), and the *Sistrurus*, or ground rattlers. At least one species of poisonous snake has been reported to inhabit each State in this country.

Death Reports

A list of the deaths, 71 in all, resulting from the bites of poisonous snakes in the United States during the 5-year period 1950-54 was obtained from the National Office of Vital Statistics, Public Health Service. This list contained the number of the death certificate, the date of death, and the State in which death occurred. A copy of each death certificate was then obtained from the appropriate State health department. Since the death certificates did not record all the information considered important for this study, I mailed a followup letter with a questionnaire to each physician, coroner, or other official who signed the death certificate. Of the 71 mailed, 53 questionnaires were returned. This report is based on the analysis of the 71 certificates listing poisonous snakebite as the cause of death and the 53 questionnaires.

Projections from this small sample are of doubtful value, but they are offered for want of a better base. They indicate an average of approximately 14 deaths per year and an average death rate of 0.09 per 1,000,000 population for the entire country.

The number of fatal bites and the death rates for the individual States are shown in the table. The death rates, reported as deaths per 1,000,000 population, were highest in the following States: Arizona, 1.15; Florida, 0.65; Georgia, 0.63; Texas, 0.44; and Alabama, 0.32.

Of the 71 victims of poisonous snakebites, 53 were male and 18 female. The high proportion of deaths among males probably reflects their increased exposure owing to recreational habits and to occupations out of doors.

As shown in the following tabulation of deaths according to age, 39 percent of the deaths occurred in youngsters less than 15 years old. A study of the incidence of poisonous snakebites in Florida found that 49 percent of all

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the bites were experienced by children or youths less than 20 years of age (3). The large number of deaths in this age group is consistent with the observation that the ratio of units of venom injected to units of body weight is greater in children. Evidently, susceptibility to snake venom poisoning is greater in both extremes of life, for approximately 32 percent of the deaths were in persons 50 years old or more.

Age (years)	Number of deaths
0-4-----	16
5-9-----	7
10-14-----	5
15-19-----	3
20-29-----	3
30-39-----	7
40-49-----	7
50-59-----	15
60-69-----	4
70 and over-----	4

The occupational groups suffering most fatalities from snakebite were the following: agricultural workers, 25; other out-of-doors workers, including woodsmen, common laborers, and highway workers, 15; preschool children, 16; school children, 11; and housewives, 7. Closely related to the victim's occupation was his activity at the time of the fatal bite. Although the activity was not stated in 21 instances, of the other 50, 15 persons were bitten while working on a farm, 9 were bitten while engaged in other out-of-doors work, 16 children were bitten while playing near their place of residence, 8 persons were bitten while handling or trying to kill a snake, and only 2 were bitten while engaged in recreation. Of the 8 persons bitten while handling a poisonous snake, 5 were engaged in religious ceremonies in Kentucky and Alabama. The Kentucky State Board of Health reported 7 snakebite deaths resulting from religious snake handling between 1940 and 1955. Several of these victims refused treatment until it was too late.

The months during which fatal snakebites were most frequent were: June, 6; July, 10; August, 14; and September, 11. There was a gradual increase in the number of deaths beginning in March and reaching a peak during August and September. This seasonal distri-



Eastern diamondback rattlesnake (*Crotalus adamanteus*), one of the most dangerous snakes indigenous to the United States.

bution has been observed in other surveys of snakebites (3-5).

Crotalus species cause most of the fatal snakebites in the United States: Rattlesnakes accounted for 55 of the 71 deaths in this study. Cottonmouth moccasins were responsible for 2 deaths, and a coral snake caused 1. Two other deaths were attributed to unknown species of pit vipers. The offending reptile was not identified in the remaining 11 deaths. The large rattlesnake species and the cottonmouth moccasins more frequently produce cases of severe envenomation than do copperhead moccasins and ground rattlesnakes. Coral snakes, though quite poisonous, are not as aggressive as the pit vipers, and they have a much more limited geographic range.

Site of Bite

Snakes most frequently bite the extremities. In this study, 37 (52 percent) of the patients were bitten on the lower extremities, and 26 (37 percent) were bitten on the upper extremities. One patient was bitten on the face, and another was bitten on the thorax. For six patients, information about the site of the bite could not be obtained. Three patients suffered from two or more bites from the same snake. Physicians attending three other patients reported that the venom was injected directly into the blood stream through veins in the legs. This in-

travenous injection of the venom, rather than the usual lymphatic and subcutaneous spread, probably produced death despite heroic treatment. Four other patients were bitten on the proximal portion of an extremity, which allowed for more rapid dissemination of the venom into the body. The other fatal snakebite wounds did not differ from the majority of wounds reported in nonfatal snakebites (3, 4).

The interval between the time of the snakebite and the time of death is given below. Contrary to popular expectation, few patients died within the first hours following a bite. Thirty-five (49 percent) of the patients expired from 6 to 18 hours after becoming envenomated. In this period, the venom is absorbed into the body and exerts its maximum toxic effects. Of the patients who died 3 or more days following the bite, 3 died either from infection or gangrene, or both, and 1 died from a transfusion reaction.

Time Interval	Number of deaths
0-1 hours	3
2-5 hours	10
6-11 hours	19
12-18 hours	16
19-24 hours	6
25-48 hours	9
3 days	2
6 days	2
7 days	1
10 days	1
Unknown	2

Attending physicians were asked to check a list of remedies and measures used for treatment. In most instances, the treatment conformed to current recommended practices. It included the use of a tourniquet with incision and suction (6), and administration of antibiotics, tetanus antitoxin, and antivenom (7).

A factor which certainly cost many lives was the long interval between the time the patient was bitten and the time treatment was begun. The interval before treatment was less than 1 hour for 14 patients; from 1 to 4 hours for 19 patients; from 5 to 7 hours for 9 patients; from 8 to 10 hours for 3 patients; from 11 to 17 hours for 4 patients; from 18 to 24 hours for 2 patients; and more than 24 hours for 2 patients. Thus, approximately 36 percent of these 53 patients were seen 4 or more hours after the bite.

Information concerning the timelag before treatment was not available for 18 patients.

In my experience and from analyzing 241 nonfatal snakebites in Florida, approximately 65 percent of the patients were seen within 2 hours after the bite, and approximately 95 percent were seen within 4 hours. The lag before treatment in the fatal bites gives the venom ample time for absorption into the body and reduces the effectiveness of a tourniquet, incision, and suction. Failure to seek prompt medical attention is attributed to ignorance or religious bias. Many others, especially children, were vulnerable because they lacked boots, long trousers, or other protective clothing. The most important measure to prevent death from snakebite is prompt and vigorous treatment of the wound.

Summary

An analysis of 71 deaths from poisonous snakebites in the United States during the

Deaths from poisonous snakebites in the United States, 1950-54

State	Total deaths	Average deaths per year	Average deaths per 1,000,000 population ¹ per year
Arizona	5	1.0	1.15
Alabama	5	1.0	.32
Arkansas	2	.4	.22
California	7	1.4	.12
Florida	10	2.0	.65
Georgia	11	2.2	.63
Kentucky	2	.4	.14
Louisiana	1	.2	.07
Mississippi	2	.4	.19
Missouri	1	.2	.05
New Mexico	1	.2	.27
North Carolina	1	.2	.05
Oregon	1	.2	.12
South Carolina	2	.4	.18
Tennessee	1	.2	.06
Texas	18	3.6	.44
Nebraska	1	.2	.15
Total	71	14.2	2.09

¹ Estimated 1952 population for each State published by the U. S. Bureau of the Census in its Current Population Reports, Series P-25, No. 97, 1954.

² Based on total 1952 population for the United States.

period 1950-54 found the highest death rates in Arizona, Florida, Georgia, Texas, and Alabama.

The most frequent victims were under 15 or over 50 years of age. Most of the victims were workingmen occupied out of doors or children playing around their residence. Rattlesnake species inflicted at least 77 percent of the fatalities, 90 percent of those for which the species was identified.

The bites of the wounds were predominantly on the extremities: 52 percent on the lower and 37 percent on the upper.

The most important factor in the failure of these patients to survive was the interval between the time of the bite and the time of medical treatment. Other important factors were the large number of rattlesnake bites, the age and weight of the victims, and the nature and location of the wounds.

Early and vigorous treatment of all severe cases of snake venom poisoning is recommended.

REFERENCES

- (1) Porges, N.: Snake venoms, their biochemistry and mode of action. *Science* 117: 47-51, Jan. 16, 1953.
- (2) Swaroop, S., and Grab, B.: Snakebite mortality in the world. *Bull. World Health Org.* 10: 35-76 (1954).
- (3) Parrish, H. M.: On the incidence of poisonous snakebites in Florida: Analysis of 241 cases occurring during 1954 and 1955. *Am. J. Trop. Med. & Hyg.* In press.
- (4) Swartzwelder, J. C.: Snake-bite accidents in Louisiana: With data on 306 cases. *Am. J. Trop. Med.* 30: 575-589, July 1950.
- (5) Wood, J. T.: A survey of 200 cases of snake-bite in Virginia. *Am. J. Trop. Med. & Hyg.* 3: 936-943, September 1954.
- (6) Jackson, D., and Harrison, W. T.: Mechanical treatment of experimental rattlesnake venom poisoning. *J. A. M. A.* 90: 1928-1929, June 16, 1928.
- (7) Watt, H. F., Parrish, H. M., and Pollard, C. B.: Repeated poisonous snakebites in the same patient. *North Carolina Med. J.* 17: 174-179, April 1956.

Study of Fallout Effects in Laboratory Animals

A method for duplicating and studying the effects of radiation fallout in laboratory animals has been developed by a Defense Department research team. Col. Carl F. Tessmer and Capt. Frank L. Jennings of the Armed Forces Institute of Pathology described this development as a further step in the study of these effects on humans, in a paper presented before the joint sessions of the American Society of Clinical Pathologists and the College of American Pathologists on October 4, 1957.

In their experiments, skins of pigs, which are closely similar to human skins, were exposed to large doses of electron beams from an atom smasher made available by the National Institutes of Health, Public Health Service. Resulting skin lesions, they reported, duplicated lesions produced by fallout, with early pigmentation of the skin followed by a breakdown in skin tissues.

The investigators used a segment of the electron beam from the atom smasher—two energies of the beta rays—that most nearly reproduces fallout in range and effects. They pointed out that this study should permit closer examination of both immediate and long-range effects of various radiation dosages.

Comparison of Stool Collection Techniques in Amebiasis Investigations

KATHLEEN HARPER, B.S., MAURICE D. LITTLE, B.S., and A. L. MARSHALL, JR., M.D.

OUTBREAKS of amebiasis occur unexpectedly and sporadically, and their investigation presents laboratory problems of considerable magnitude. The average diagnostic laboratory has a minimal staff of parasitologists and is unprepared to examine large numbers of stools. Furthermore, routine diagnostic procedures may not be suitable for use in field studies.

Since an investigation of amebiasis should include the detection and identification of both trophozoites and cysts of *Entamoeba histolytica*, freshly passed stools should be submitted to the laboratory only as rapidly as they can be examined. To do this may require setting up a laboratory near the area of investigation and arranging for the services of additional parasitologists.

In Indiana, the State board of health laboratories have been unprepared to provide all the services needed during outbreaks of amebic dysentery. Major difficulties have been insufficient time to make preparations for increased laboratory services, a parasitology staff already fully engaged in normal functions of the laboratory, coordination of the field investigation and laboratory programs so that specimens received at the laboratory while still fresh or adequately preserved would arrive no faster than examiners could handle them, and employment of efficient and feasible parasitological techniques.

In this study, an effort was made to establish a diagnostic procedure which would be readily applicable in epidemiological investigations of amebiasis and which would minimize the difficulties of laboratory participation.

Routinely, stool examinations are made on specimens submitted in polyvinyl (PVA) fixative two-bottle stool collection outfits (1, 2). While these techniques were effective for diagnostic purposes, their performance was too complex for use in extensive investigations of amebic dysentery. The stain preservation technique (3) using merthiolate, iodine, and formalin (MIF) and the MIF concentration technique (4) showed promise as a survey tool for investigation of sporadic outbreaks of amebic dysentery.

Use of these two techniques in several small surveys for *E. histolytica* gave such favorable results that a comparative study was made of this procedure and of the PVA fixative two-bottle stool collection-examination method. The results of this comparison and the manner of application of the MIF and MIF concentration techniques in an emergency investigation of a possible outbreak of amebic dysentery are presented in this report.

Methods

Specimens were obtained from inmates of a State mental institution. One stool per patient was collected. For each patient, the attendants

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were provided with an empty bottle for an unpreserved portion of the stool, a bottle of prepared PVA fixative solution, and a bottle for the collection of the MIF-preserved stool. The attendants added an appropriate amount of each freshly passed stool to each bottle. Specimens were collected twice a week and promptly transported to the laboratory. Since unpreserved stools were included in this series, specimens were collected only as rapidly as the examiners could handle them. Altogether, 110 specimens of 3 stool portions each were obtained.

Collection Techniques

In the PVA fixative two-bottle collection method, one portion of each freshly passed stool, about the diameter of a quarter, was placed in an empty bottle. In another bottle, an equal quantity of feces was thoroughly mixed with the PVA fixative solution to approximate a mixture of 1 part feces and 2 parts preservative. This method (2) was used to prepare the first two portions of the fecal specimens, and an equal amount of each specimen was mixed with MIF solution in a third bottle.

The MIF stain preservative consists of a stable stock merthiolate formalin (MF) solution and Lugol's iodine solution. These solutions were prepared in quantities sufficient to complete the study, dispensed separately, and combined in aliquot proportions by the persons collecting the stools. The stock MF solution (3) was prepared by mixing 250 ml. of distilled

water, 200 ml. of tincture merthiolate No. 99, 1:1,000 (Lilly), 25 ml. of solution formaldehyde U.S.P., and 5 ml. of glycerine, and dispensed at 14.1 ml. per collection bottle. The Lugol's stock 5 percent iodine solution was stored in the refrigerator in a brown glass bottle and dispensed as needed, 0.9 ml. per cork-stoppered 13×75 mm. test tube.

One bottle of MF solution and one test tube of Lugol's iodine solution were provided for each specimen to be submitted in MIF preservative. Immediately after passage of the stool, the attendant added one aliquot of iodine to one bottle of MF solution, then added the appropriate amount of feces, and mixed them thoroughly.

Examination Techniques

As the specimens arrived at the laboratory, each set of three stool portions was examined by the following techniques:

Technique 1. At least 1 saline and 1 Lugol's iodine wet mount were examined from different areas of each specimen of unpreserved stool; additional amounts were examined only when necessary to identify species.

Technique 2. Each unpreserved specimen was also examined by the zinc sulfate concentration technique described in an earlier report (2).

Technique 3. Routinely, only one fecal film from each PVA fixative preserved stool was permanently stained with iron hematoxylin. When necessary for identification of protozoa, 1 or

Table 1. Number of times protozoa were found in 110 stools and methods of detection

Protozoa	Combined methods	Unpreserved stools		PVA fixative stools	MIF stools	
		Direct wet mount	Zinc sulfate flotation	Hematoxylin stained smear	Direct wet mount	MIFC
<i>Entamoeba histolytica</i>	32	10	10	21	19	27
<i>Entamoeba coli</i>	76	44	58	43	55	70
<i>Iodamoeba bütschlii</i>	1	0	0	1	1	0
<i>Endolimax nana</i>	44	16	14	34	24	27
<i>Giardia lamblia</i>	5	5	2	4	4	4
<i>Chilomastix mesnili</i>	30	12	7	27	18	23
<i>Trichomonas hominis</i>	1	1	0	1	1	1
Unidentified protozoa.....	19	9	8	5	6	6
Total.....	208	97	99	136	128	158

2 additional smears were examined. This technique is also described in the earlier report (2). A fecal smear was prepared on a 75×25 mm. glass slide, dried overnight, and stained with a modification of the Tompkins-Miller rapid iron hematoxylin phosphotungstic acid method (5). If the protozoa could not be identified, additional smears were stained by the Heidenhain long iron hematoxylin method.

Technique 4. At least one direct wet mount from each MIF-preserved stool was examined. A drop of fecal suspension was placed on a glass slide and a coverslip was added. If the suspension was too thick for good visibility, the drop of material was mixed with a drop of saline. With a few exceptions, no additional staining was necessary, although an additional smear was occasionally prepared in a drop of Lugol's iodine or MIF stain formula for the direct smear technique in order to bring out the iodine phase or to enhance specific differential structures.

Technique 5. The merthiolate-iodine-formaldehyde concentration technique (MIFC) developed by Blagg and associates (4) for use with MIF-preserved stools was performed on all stools received in MIF. The steps in this procedure follow:

1. Shake the specimen vigorously for about 5 seconds. If mixture appears too viscous to strain easily through gauze, dilute with stock MF solution before shaking.

2. Strain mixture through two layers of wet gauze into a lipless conical paper cup and immediately pour 10 ml. into a 15-ml. graduated centrifuge tube.

3. Add 4 ml. of ether, stopper and shake vigorously. If ether remains on top, add 1 ml. of tap water and reshake.

4. Remove stopper and let stand 2 minutes.

5. Centrifuge for 1 minute at 1,600 r.p.m. Four distinct layers should appear: a top layer of ether, a plug of fecal detritus, an MIF layer, and a small amount of sediment.

6. Loosen the fecal plug by ringing with an applicator stick. Quickly pour out all but the bottom layer of sediment.

7. Mix the sediment and make a coverslip preparation. Slide the coverslip over the drop of sediment, so that coarse particles remain outside the periphery while the fluid and any parasites run underneath the coverslip.

All examinations were made by two parasitologists, with cross-checking for identification purposes.

Results

In the combined examinations of 110 stools, protozoa were found 208 times (table 1). *E. histolytica* was found 32 times and other protozoa 176 times. Ten pinworm infections were found; however, since this report is concerned with protozoa only, these data are not included. Thirteen *E. histolytica* organisms were of the small race type; 19 protozoa were not specifically identified by examination of a single specimen.

The relative efficiency of the techniques for all protozoa ranged from 46.6 percent for direct wet mounts of unpreserved stools to 76.0 percent for the MIF concentration technique; for *E. histolytica* only, from 31.2 to 84.4 percent, respectively. The second most efficient single technique was the PVA fixative hematoxylin stained fecal smear, which yielded 65.4 percent of the total protozoa and 65.6 percent of the *E. histolytica*.

Efficiency of Combinations of Methods

The diagnostic yields of combinations of techniques are shown in table 2. The triple combination of hematoxylin stained PVA fixative smears, direct wet mounts from MIF-preserved stools, and the MIF concentration technique yielded all 32 *E. histolytica* and missed only 3 of the 189 specifically identified protozoa. However, the hematoxylin stained fecal smears plus the MIF concentration technique missed only 1 *E. histolytica* (large race) and 4 other protozoa (1 *Entamoeba coli*, 2 *Endolimax nana*, 1 *Giardia lamblia*). Only 34.4 percent of the *E. histolytica* and 62.4 percent of the other protozoa species could have been reported from examinations of the unpreserved stools alone.

Tables 1 and 2 would seem to indicate that when only one technique can be employed, the MIF concentration method is preferable. However, if two techniques can be used, the combination of MIF concentration and hematoxylin stained PVA fixative fecal smears appears to be so efficient that the addition of any

Table 2. Number of times protozoa were found and identified by combinations of techniques

Technique	Total protozoa	<i>Entamoeba histolytica</i> race type			Other protozoa
		Large	Small	Both	
Saline and iodine direct wet mount ¹	109	11	0	11	98
Zinc sulfate flotation ¹					
Saline and iodine direct wet mount ¹	168	15	8	23	145
Zinc sulfate flotation ¹					
Hematoxylin stained fecal smear ²	158	15	12	27	131
Zinc sulfate flotation ¹					
MIF concentration ³	184	18	13	31	153
Hematoxylin stained fecal smear ²					
MIF concentration ³	162	16	12	28	134
Direct wet mount ³					
MIF concentration ³	163	19	9	28	135
Hematoxylin stained fecal smear ²					
Direct wet mount ³	186	19	13	32	154
Hematoxylin stained fecal smear ²					
Direct wet mount ³	189	19	13	32	157
MIF concentration ³					
All techniques					

¹ Unpreserved stool.

² PVA fixative preserved stool.

³ Merthiolate, iodine, and formalin preserved stool.

of the other techniques would be unnecessary. The MIF direct wet mount technique would appear to be of little additional value in detecting protozoa since the combined MIF direct wet mount and the MIF concentration technique did not significantly increase the number of protozoa found by the MIF concentration method alone.

Trophozoites and Cysts

Trophozoites and cysts when found were recorded for each specimen examined and for each technique employed (table 3). The MIF concentration and hematoxylin stained fecal

smear techniques gave comparable results for *E. histolytica* trophozoites. The former appeared less efficient for other trophozoites. However, frequently when trophozoites alone were encountered in the stained fecal films, both cysts and trophozoites were found by the MIF concentration technique. This technique appeared highly efficient for cysts of *E. histolytica* and other protozoa.

In MIF-preserved stools, because of the clearing and staining qualities of the preservative, *E. histolytica* cysts were as easily identified, and, of course, more easily found, in concentrated specimens as in stained PVA fecal films. *E.*

Table 3. Number of times protozoan cysts and trophozoites were found and identified by each examination technique

Technique	All protozoa		<i>E. histolytica</i>		Other protozoa	
	Trophozoites	Cysts	Trophozoites	Cysts	Trophozoites	Cysts
Direct wet mount	4	84	0	10	4	74
Zinc sulfate flotation	1	91	0	10	1	81
Hematoxylin stained smear	90	76	14	14	76	62
MIF direct wet mount	51	90	8	14	43	76
MIF concentration	62	126	13	23	49	103
All techniques	101	153	18	27	83	126

histolytica trophozoites were easily identified in MIF-preserved stools, although perhaps not as easily as in the stained PVA fecal films. In preparations from MIF-preserved stools the nuclei and cytoplasm of *E. histolytica* cysts and trophozoites and the chromatoidal bodies of the cysts were clearly visible in the majority of organisms present in any one specimen; the small race *E. histolytica* was exceptionally easy to identify.

Trophozoites of other protozoan species, especially of flagellates, were usually easily identified. Occasionally, there was some hesitancy in specifically identifying the trophozoites of *E. nana* and *E. coli*. Although *Dientamoeba fragilis* was not encountered in this study, observations made with other groups of MIF-preserved stools have shown that *D. fragilis* trophozoites can be identified without too much difficulty after some experience with this species. On the other hand, the protozoan cysts rarely presented any difficulty of identification. Pseudopodia of ameba were frequently present in preparations made from the concentrated MIF specimens and were even more obvious in direct wet mounts made from the unconcentrated specimen. Protozoan cysts are most easily detected by scanning saline wet mounts made from unpreserved stools. However, after experience with wet mount preparations made from MIF-preserved specimens, the cysts are almost as easily found in the latter type of stool.

Application of MIF Technique

Results of the comparative study of methods and the use of the MIF stain preservative method of collecting stools in amebiasis investigations appear to justify planning for this type of stool collection.

The first opportunity to employ this technique in an emergency occurred during the summer of 1956. The diagnosis of three cases of amebiasis among the faculty of a college in northwestern Indiana resulted in a request from college officials for a sanitary survey. The Indiana State Board of Health received this request between the termination of summer school and the beginning of the fall semester. Engineers made a thorough inspection of all plumbing and sanitary installations and sanitarians

inspected kitchens and food storage facilities. Although both reports were satisfactory, it seemed advisable to make examinations of stools from the resident faculty, food handlers, and other permanent employees and to take necessary remedial measures before arrival of the students in the fall. It was felt that at least 3 stools from each of the 125 persons involved should be examined.

Basic plans of procedure were devised in consultations among representatives of the college and of the State board of health. With the MIF stool collection technique the field investigators were able to obtain epidemiological data and to collect specimens independently of the laboratory program, thus reducing considerably the time between the request for an investigation and the receipt of specimens in the laboratory.

MIF collection kits were assembled as described under "Methods." To prevent absorption of iodine, the cork stoppers for the test tubes of iodine solution were coated with paraffin. Applicator sticks for adding and mixing the specimens and detailed instruction sheets for the use of investigators were included in the collection kits.

The investigators obtained the history of each person and supplied him with 3 collection kits, with instructions that a stool be collected every 3 or 4 days and that the 3 specimens be delivered together to the college dispensary. The first, second, and third stools were taken to the laboratory in separate cartons. Since approximately half the persons in the study were away on vacation, two collections were made, the second several weeks after the first.

In the laboratory, all specimens were numbered and recorded. Assembly line methods were used in preparing them for examination. During the processing, the first, second, and third stools from each person were kept in separate groups. Individuals from other laboratory units were assigned to the project for brief periods during each step of the processing.

The first specimens were concentrated by the MIF concentration technique, with the aid of one technician. The centrifuge tubes were tightly stoppered and stored in the refrigerator until the sediment could be examined by the parasitologists. Examination of approximately

half of these concentrates indicated that very few would be positive for *E. histolytica* and that all three stools from nearly every person in the study probably would need to be examined. The second and third specimens were then concentrated and stored in the refrigerator.

The assistance of a parasitologist from another institution was necessary to complete on schedule the examination of stools from persons who were on vacation during the first collection. Since all the specimens had been concentrated, schedules of the processing team and the parasitologists did not need to be coordinated.

Since previous studies had indicated that the MIF concentration technique alone was highly efficient, and since three stools were obtained from each individual in the study, no other laboratory technique was employed routinely. However, to check the efficiency of the MIF concentration technique, direct wet mount preparations from a representative number of the MIF-preserved stools were examined; no additional protozoa were found.

Critical reports were obtained on all but six persons. Because rare suspicious *E. histolytica* forms were found in the stools, additional specimens in MIF preservative were requested from three of these individuals. In order to confirm species identification, additional specimens were also obtained in PVA fixative for hematoxylin permanent staining from the other three individuals found to harbor trophozoites of protozoa other than *E. histolytica*.

Altogether, 368 specimens were obtained from 120 of the 125 persons in the study; 5 persons did not submit stools. Twenty-seven persons harbored the following protozoa species: 6 *E. histolytica* (4 small race type), 14 *E. coli*, 15 *E. nana*, 1 *D. fragilis*, 1 *Iodamoeba bütschlii*, 3 *G. lamblia*, 1 *Chilomastix mesnili*, and 1 *Trichomonas hominis*. The incidence of *E. histolytica* was considered to fall within the normal range.

Only 2 of the 6 persons whose specimens were positive for *E. histolytica* were kitchen employees. They were removed from their duties and intensive therapy was begun. In view of satisfactory reports from the engineers concerning the general environmental factors and of the low rate of infection among the staff, the

school facilities were not considered to be the source of the infection. The college was advised that it would not be practical to examine the stools of all students. After a conference with the school authorities and the local health officer, the school physician planned to submit stool specimens of any student or member of the faculty who presented himself to the dispensary with symptoms suggestive of amebiasis. This program should insure early treatment of new cases and should alert the school and the health authorities when several cases occur simultaneously.

The investigation of this potential outbreak in a school indicates the need for a relatively simple procedure for collecting and examining stools for amebiasis to insure early attention to any outbreak and to encourage adequate surveillance. If the incidence of infection in this institution had been sufficient to cause concern, the rapid conclusion of the investigation would have permitted the initiation of remedial measures before the situation became alarming.

Discussion and Summary

Results of examining unpreserved stools collected in PVA fixative and in merthiolate, iodine, and formalin (MIF) stain preservative have indicated the value of the MIF preservative technique for collecting stools and of the MIF concentration method of examination for *Entamoeba histolytica* and other protozoa, as well as the high relative efficiency of the combined MIF concentration and hematoxylin stained PVA fixative fecal smear techniques for finding protozoa.

Experience with the identification of protozoa in saline and iodine wet mount preparations, in hematoxylin stained PVA fecal smears, and in MIF-preserved stools has shown that intestinal protozoa in MIF stain preservative usually are more easily identified than those encountered in wet mount preparations of unpreserved specimens, and in most instances are as readily identified as those found by examining hematoxylin stained PVA fixative stools. The iodine phase of staining disappears in MIF-preserved stools as the specimens age (3). This phase may be readily restored by making wet mount preparations with the MIF stain formula for direct wet mounts or with a plain iodine stain. How-

ever, as experience is gained with this technique there is usually less inclination to add additional stain except for an occasional differentiation of a specific structure.

The adaptation of the MIF stool collection method and MIF concentration examination techniques for use in the emergency investigation of a suspected outbreak of amebiasis demonstrates the flexibility and advantages of this procedure as a survey tool. In this and in other surveys, the procedure proved to be efficient in detecting and identifying protozoa, particularly *E. histolytica*. Many problems of collecting and transporting specimens to the laboratory were avoided, and cooperation in the use of this technique from field personnel and others was excellent. The method can be developed in a laboratory far in advance of its actual use and quickly put into operation when needed. Since each group of personnel can work independently of the others, difficulties arising from attempts to coordinate on short notice the activities of the field investigators, the persons to be examined, the laboratory processing crew, and the parasitologists are almost completely eliminated.

An additional advantage of the technique is that, before the specimen is submitted, each individual being examined preserves, fixes, and stains any parasites which he harbors. MIF-preserved specimens may be conveniently concentrated by the MIF concentration technique. The sediments, plus a small amount of MF solution, can be stored in the refrigerator and held for several months without appreciable difference in the ease with which the parasites can be identified. Specimens may be concentrated in one laboratory and the sediments transported to another for examination by parasitologists.

Since parasites usually remain identifiable after long storage in MIF preservative, a laboratory can build up a collection of specimens for training personnel in the identification of MIF-preserved parasites. A few weeks of training is usually adequate, and the personnel are available as examiners when needed.

In this study, almost 100 percent relative efficiency in detecting protozoa was obtained with the combined MIF concentration and hematoxylin stained PVA fixative fecal smear techniques. This combination would appear to be excellent for detecting *E. histolytica*. How-

ever, the more complicated PVA fixative hematoxylin staining method may make the combination impractical. If so, the single MIF concentration technique, which requires only one collection preservative, with repeat specimens obtained either in MIF or in PVA fixative, would appear to be far superior to the usual method of collecting unpreserved stools, especially since the MIF concentration technique alone was almost as efficient as the combined techniques for *E. histolytica*, which is the primary concern in amebic investigations.

Helminth eggs are also easily detected and identified by the MIF concentration technique. Blagg and associates (4) have reported results indicating that this technique is more efficient in recovering helminth eggs than the concentration methods usually employed.

Results of these investigations and of additional applications of the MIF stool collection technique in a number of smaller surveys indicate that this method is the most effective and practical parasitological survey tool for amebic examinations with which the authors have had experience.

A portion of the data from the comparison of methods has been included in an earlier report on the advantages of the PVA fixative two-bottle stool collection technique (2).

REFERENCES

- (1) Brooke, M. M., and Goldman, M.: Polyvinyl alcohol-fixative as a preservative and adhesive for protozoa in dysenteric stools and other liquid materials. *J. Lab. & Clin. Med.* 34: 1554, November 1949.
- (2) Harper, K., Little, M. D., and Damon, S. R.: Advantages of the PVA-fixative two-bottle stool collection technic in the detection and identification of intestinal parasites. *Pub. Health Lab.* 15: 96, July 1957.
- (3) Saper, J. J., and Lawless, D. K.: The "MIF" stain-preservation technic for the identification of intestinal protozoa. *Am. J. Trop. Med. & Hyg.* 2: 613, July 1953.
- (4) Blagg, W., Schloegel, E. L., Mansour, N. S., and Khalaf, G. I.: A new concentration technic for the demonstration of protozoa and helminth eggs in feces. *Am. J. Trop. Med. & Hyg.* 4: 23, January 1955.
- (5) Tompkins, V. N., and Miller, J. K.: Staining intestinal protozoa with iron-hematoxylin-phosphotungstic acid. *Am. J. Clin. Path.* 17: 755, September 1947.

Cytoanalyzer

The cytoanalyzer, an automatic optical electronic machine which may greatly speed detection of cancer of the uterus, has been installed by the National Cancer Institute, Public Health Service, at the University of Tennessee in Memphis, for further testing. The machine is designed to detect abnormal cells by microscopically scanning slides of specimens from vaginal smears almost as fast as they are fed into it.

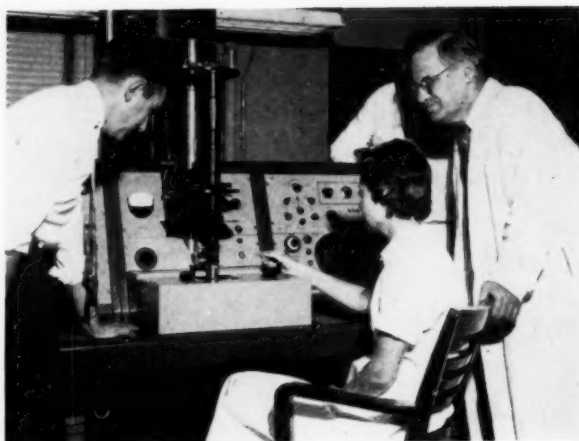
Cancer of the uterus is the second largest cause of cancer deaths among women. This fact and the current scarcity of technicians to analyze cell examination results underline the importance of perfecting the cytoanalyzer, which through speedier detection of the disease, may lead to more cures. The majority of women with uterine cancer can be cured if the disease is diagnosed in its early stages.

The cytoanalyzer being tested at Memphis was developed by the Airborne Instruments Laboratory, Inc., Mineola, N. Y., where Walter E. Tolles directed the research. Dr. George N. Papanicolaou, professor emeritus of clinical anatomy at Cornell University Medical College, has been consultant.

At the Memphis project, results given by the machine will be compared with those obtained by present methods in which technicians examine specimens under a microscope, and suspicious specimens are then referred to a pathologist. If the machine is perfected, the pathologist will examine only the slides selected by the electronic scanner.

The machine consists of a scanning microscope, computer and analyzer, and recorder. The scanner examines the pertinent area of the smear and converts the optical information into an electric beam which is passed to the computer and analyzer.

The computer measures the cells' nuclear size and nuclear optical density and distinguishes between signals arising from normal and suspicious cells. A nuclear measurement graph



At the University of Tennessee in Memphis, the cytoanalyzer undergoes testing for further development. Observing the machine's performance are, from left to right, Riley C. Bostrom, project engineer, Airborne Instruments Laboratory; Irma Rube, chief cytologist, Public Health Service; and Dr. Douglas H. Sprunt, professor of pathology and chairman of the division of pathology, Medical School of the University of Tennessee.

plots each accepted measurement so that cells can be rated as normal, suspicious, or deficient in information. The recorder makes a permanent record of the graph, notes the location of all abnormal measurements, and records the decision of the automatic smear classifier. Recordings of the nuclear measurement graph are made by a high intensity cathode ray tube and an oscillograph. All computations are made by the machine as the slide is scanned in less than one-fifth of a millisecond.

The Memphis project is concerned solely with uterine cancer. However, the National Cancer Institute is in the process of setting up four new centers to develop the application of the cytologic test to cancer of other body sites, the lung, large intestine, stomach, prostate, and urinary tract. Successful development of the cytoanalyzer will probably lead to its use in detecting cancer in these other sites.

Home ACCIDENT

Data

Statistical Resources

IN PLANNING a safety program, a health department depends on the statistician for the facts about the number and nature of home accidents: How many deaths are caused? How many injuries occur? What age groups are most affected? What situations or objects are associated? Information of this kind helps define immediate and long-term objectives.

Although current figures on nonfatal home accident injuries are scanty, data on injuries from home accidents are being collected in the National Health Survey. Estimates of home accident injuries for the United States will be available soon for quarterly periods commencing with July–September 1957. After a year's information has been collected, there will be data on home accident injuries by age and sex, for urban and rural areas, and for the four broad geographic regions of the country. After 2 years, figures will be classified for 11 geographic divisions, with separate data for 8 metropolitan areas of 2 million or more, other

standard metropolitan areas, all other urban areas, and rural areas. A farm and nonfarm breakdown will also be available.

From figures now available we know that falls are outstanding as causes of death. Minor injuries from nonfatal home accidents are primarily cuts or burns. Women have minor injuries more frequently than men. Home accidents are especially frequent among children and elderly persons. Poisonous chemicals common in households—kerosene, detergents, metal polish, bleaches—are responsible for many accidents to children under 5 years old.

To obtain incidence data for home accident injuries, the health department team may try an area survey, a study of hospital and clinic admissions, or an arrangement with physicians whereby cases treated are reported to the health department. A survey is expensive, while the other two methods give unrepresentative and incomplete coverage, especially for minor injuries. The choice can best be made by relating the program objectives to the kind and quality of information that may be collected and the cost of obtaining it.

The statistician can help measure progress of the program. Several years may elapse before the death and injury rates are affected. In the meantime, staff members are gaining experience; hazards are corrected; knowledge of hazards is improved; and public reaction may be judged by repeated requests for literature or speakers. More suggestions of this kind are given in a guide to the collection, analysis,

Based on an address by Evelyn Halpin, Ph.D., program analyst, National Office of Vital Statistics, Bureau of State Services, Public Health Service. Dr. Halpin's paper and the one by Dr. Cameron, which follows, were given at a joint meeting of the health education section and the statistical and clerical section of the Southern Branch of the American Public Health Association, Asheville, N. C., May 31, 1957.

and interpretation of service statistics in home accident prevention, developed by the Public Health Conference on Records and Statistics in 1956 (*Public Health Reports*, June 1957, pp. 494-498).

With the help of a records analyst, nurses and sanitarians may discover how to study or supplement their records so as to learn what portion of their time is spent on home accident prevention and what they have accomplished. They may also learn from him to apply sampling methods or periodic studies so that the burden of paperwork will be lightened.

Uniform definitions improve communication and measurement. For this reason, the American Public Health Association, the Public Health Service, and the National Safety Council sponsored a Conference on Definitions of Accidents in April 1957. While the tentative definitions prepared by the conference should be useful, they do not contain the classifications needed to analyze data nor do they specify the criteria that may be used in counting accidental injuries. The question of what to count in surveys or special studies must be answered by those who conduct a home safety program.

A basic innovation of the definitions is the presentation of the concept of an accident as a sequence or chain of events growing out of interactions of numerous factors, rather than a single event arising from one cause. This is in keeping with recognition of the multiplicity of agents and forces that influence the occurrence of accidents and the severity of the consequences. The concept of a sequence of events in accident situations, by identifying component factors, helps to indicate where preventive measures will be effective.

Professional guidance is useful in designing simple and effective records. Also, it is desirable to put new or revised record forms through a test before broad application. The public health nurse and the sanitary engineer can help to spot flaws in the forms and suggest modifications. Dummy table forms will outline the end product of any scheme for collecting data and will show whether the information is in the desired form. It is self-defeating to seek more information than can be reasonably and meaningfully tabulated and analyzed.

The statistician provides technical assistance to health officials in collecting and interpreting the figures they need to plan their work. With their help, he supplies information for appraising the importance of home accidents, defining objectives, and assessing accomplishments.

Local Sources

ONE of the first questions raised in the planning of a community safety program is whether it is satisfactory to plan on the basis of information derived from national experience, as recorded by the National Office of Vital Statistics and the National Safety Council, or whether plans should be prepared according to conditions peculiar to the local region, as established by local house-to-house surveys. Certain health departments have gone so far as to develop detailed classification systems to aid in the coding and analysis of accident information.

In the past the buckshot approach has been successful in public health practice because, with a variety of afflictions and causes in a community, almost any constructive measure—sanitation, housing, nutrition, education, or immunization—was bound to have some salutary effect. Today both economy and effectiveness are served by programs that apply specific controls aimed at specific defects. Realization of this need to replace the blunderbuss with the sharpshooter has introduced the term “community diagnosis.” Community diagnosis reaches conclusions based on a comprehensive history of past conditions coupled with specific examination techniques for obtaining a current appraisal of public health status. The scope of its application is limited, however, by the persistence of obsolescent and empirical practices.

Such diagnosis would determine whether or not farm and home safety programs warrant more attention than others. It might reveal, in certain communities, that the greater mor-

Based on a paper by Charles M. Cameron, Jr., M.D., M.P.H., associate professor, School of Public Health, University of North Carolina, Chapel Hill.

bidity and mortality results from a lack of maternity welfare services, or even of an adequate water source.

At the same time, the house-to-house survey is not essential to community diagnosis. Adequate information on the region may be available in existing records, through slight modifications of current records, or through specialized surveys.

Sources ordinarily neglected include tables of information from death certificates, records of clinics for crippled children, housing-inspection forms, or records of home visitors. Valuable though the information on death certificates may be, it is unlikely to be analyzed by town and county for age, race, and sex unless local authorities undertake the task themselves.

In North Carolina, a spot check of records of crippled children's clinics found that treatment of children injured in accidents required 10 percent of the clinic time. The nature of accidents most costly to the patient and community also can be determined from such records.

In housing records and reports of home visitors are found notations about faulty wiring, defective heating systems, dangerous stairways, and other hazards that may be of more consequence than a deficiency of toilets, careless garbage disposal, or the presence of rats and other vermin.

Other sources of information include records of hospital admissions and emergency services, fire inspections, coroners, absences from school

or work, health insurance payments, and police calls. Agricultural extension workers and safety councils also prepare reports offering valuable information on home and farm accidents.

From such records it was learned that in one locality accidents were the third most frequent cause of hospitalization; that off-the-job accidents cost more time from work in one industrial center than on-the-job injuries; that of 2,453 persons seeking emergency treatment in a California community, only 197 were injured by a car, 324 in industrial employment, and 1,932 at home or in public places.

When existing records are uninformative, slight modifications can produce the facts needed, as one Blue Cross organization learned. Many industrial health agencies have only recently begun to record off-the-job accidents.

Often special surveys may be obtained from physicians who have kept records to gain an insight into accident incidence and prevalence. More extensive surveys may reveal, as in the California morbidity survey of 1954-55, that accidents are second in frequency only to the "common cold" as a cause of acute illness. Respiratory infections caused about half of the illnesses, and accidents caused one-fourth.

With such opportunities, it appears that the health department can plan its safety program more intelligently if it taps the sources of information locally available.

Traineeships for Graduate Nurses

Grants totaling \$3 million have been made to 60 schools of nursing and public health throughout the country in the second year of a Public Health Service program to meet the shortage of nurses qualified for teaching and administrative positions. These institutions will award traineeships to qualified nurses interested in teaching in nursing schools, or in administration and supervision in hospital nursing services, nursing schools, and public health agencies.

About 800 graduate nurses will benefit from the grants. In fiscal year 1957, a total of 587 traineeships were made available to 56 institutions under a \$2 million appropriation.

publications

Bibliography of Writings by Great Names in Neurology

PHS Publication No. 554 (Public Health Bibliography Series No. 17), 1957. 80 pages.

Complete bibliographies of four great names in neurology—Joseph Babinski, Sir Victor Horsley, Sir Charles Sherrington, and Arthur Van Gehuchten—are assembled in this brochure. Each bibliography is preceded by a brief biographical sketch.

The brochure was prepared for the First International Congress of Neurological Sciences, Brussels, Belgium, July 21–26, 1957, by the National Institute of Neurological Diseases and Blindness, National Institutes of Health, Public Health Service.

Social Work in Hospitals

PHS Publication No. 519. 1957. 117 pages; tables and charts. 65 cents.

Basic factual information for 1954–55 on social service departments in an estimated 967 general and tuberculosis hospitals in the United States and their nearly 3,700 social work staff is set forth in this publication for hospital administrators and social workers. The survey, the first comprehensive one in this field since 1930, was a joint project of the American Hospital Association, the Medical Social Work Section of the National Association of Social Workers, and the Public Health Service.

Defining a social service department as one or more persons employed full or part time to perform duties that the hospital considers to be social service activities, the report covers these aspects of the subject: educational qualifications of social work staff, administration and facilities of social service departments, and major social service roles

of hospitals. It also gives the number of patients receiving social services and describes the various social service activities provided for patients.

A summary section presents major findings, conclusions, and recommendations concerning supply and utilization of social workers in hospitals.

National Venereal Disease Control Program

PHS Publication No. 56. Revised 1957. 14 pages; illustrated. 15 cents.

Originally published in 1951, this revision brings up to date a summary examination of venereal disease control problems in the United States, and of Federal, State, and local attempts to meet them.

Factors which contribute to the spread of the disease and hamper control measures are discussed. A historical background of the nationwide control program, including laboratory and epidemiological aspects, is presented.

Attention is given to organization and function of field personnel, with a description of their complex operation of case finding, treatment, and education. The place and importance of statistical control are explained.

Directory of State and Territorial Health Authorities, 1957

PHS Publication No. 75. Revised 1957. 96 pages. 35 cents.

This directory lists, as of April 1957, the title of each State health department and the name of the officer in charge, and organizational units of individual States with the names of officials directing the units. Also included are officials of State agencies other than health agencies

directing grant-in-aid programs, and State agencies officially designated for the administration of the Water Pollution Control Act and crippled children's services.

Personnel of the Public Health Service in charge of functions closely associated with State health departments are listed in the appendix.

Immunization Information for International Travel

Summary of changes June 1956–March 1957

Supplement to PHS Publication No. 384. 1957. 23 pages. 15 cents.

This supplement brings up to date the immunization requirements for entering the different countries. The principal changes are the specifying of the age at which infants are expected to be vaccinated against certain diseases at the time of entrance into a country, and the elimination of endemic zones in relation to the yellow fever vaccination requirement. Also listed are additional yellow fever vaccination centers.

WHAT YOU SHOULD KNOW ABOUT ASIAN FLU. *PHS Publication No. 561. 1957. 4-fold leaflet. 5 cents; \$3.00 per 100.* Prevention, symptoms, and treatment of Asian influenza are described briefly. Complications which demand medical attention are delineated.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

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